



Precision Strike
2008

Summer Forum



"Precision Fires as an Enabler for Force Dominance"

Parsippany, NJ

January 10 -11, 2008

Agenda

Tuesday 10 June 2008

KEYNOTE ADDRESS:

- **Major General David W. Eidsaune, USAF—Commander**, Air Armament Center, and the Air Force Program Executive Officer for Weapons, Air Force Materiel Command, Eglin Air Force Base, FL

THE EVOLUTION OF ARTILLERY FOR INCREASED EFFECTIVENESS:

- **Dominick De Mella—Chief** Cannon Artillery Division, ARDEC, Picatinny Arsenal, NJ

ARDEC's Role in Countering the IED Threat:

- **Ray Carr—**ARDEC Counter Terrorism Technology Team Lead, U.S. Army, ARDEC, Picatinny Arsenal, NJ

HIGHLY PRECISE MUNITIONS OVERVIEW:

- **Charles Kelly—Staff** Specialist, Land Warfare & Munitions, OUSD (AT&L)

ARMY PEO MUNITIONS PROGRAMS PANEL:

- **Colonel Ole Knudson, USA—**PM Combat Ammunition Systems (PM CAS), Picatinny Arsenal, NJ
- **Colonel Ray Nulk—**Office of the Project Manager for Close Combat Systems, Picatinny Arsenal, NJ

Wednesday 11 June 2008

NAVY INTEGRATED SPECIALTY SITE FOR GUNS AND AMMUNITION:

- **Mike Till—Transition** Manager for Picatinny Arsenal, NJ

NAVY ELECTROMAGNETIC GUN PROJECT:

- **Michael Elliott—Deputy** Program Manager, Office of Naval Research

FORT SILL'S ROLE IN PRECISION FIRES:

- **Kirby Brown—Deputy** to the Commanding General, U.S. Army Fires & Fort Sill, OK

GUIDED MISSILES OVERVIEW:

- **Robert Kirby—**Deputy Chief Engineer for Precision Fires Rocket and Missile Systems, Redstone Arsenal, AL

ARMY AMMUNITION REQUIREMENTS:

- **Robert Grubbs—Deputy** for Munitions, G3/7-Headquarters, Department of Army, Munitions G-3

MUNITION LOGISTICS SUPPORT PANEL:

- **Colonel Michael Mc Bride, USA—**Deputy Commander/Chief of Staff, U.S. Army Ordnance Center & Schools, Huntsville, AL
- **Al Galonski—Chief** Future Concept Division, Logistics Research Engineering Directorate, Picatinny Arsenal, NJ

MUNITIONS SAFETY:

- *Gary Carney*—*Director*, US Army Defense Ammunition Center and School, McAllister, OK

0730 REGISTRATION/CONTINENTAL BREAKFAST

Sponsored by Kaman Fuzing

0830 WELCOME:

Andy McHugh—Vice-Chairman of the Board

MG Paul Greenberg, USA (Ret)—PSA Executive Director & Event Chair

0840 OPENING REMARKS:

Brigadier General William Phillips, USA—Commander, Joint Munitions and Lethality Life Cycle Management Command and Program Executive Officer for Ammunition, Picatinny Arsenal, NJ

0900 KEYNOTE ADDRESS:

Major General David W. Eidsaune, USAF—Commander, Air Armament Center, and the Air Force Program Executive Officer for Weapons, Air Force Materiel Command, Eglin Air Force Base, FL

0945 NETWORKING REFRESHMENT BREAK

Sponsored by Whitney, Bradley & Brown, Inc.

1015 THE EVOLUTION OF ARTILLERY FOR INCREASED EFFECTIVENESS:

Dominick De Mella—Chief Cannon Artillery Division, ARDEC, Picatinny Arsenal, NJ

1045 JOINT IED DEFEAT ORGANIZATION (JIEDDO) REQUIREMENTS:

Colonel Ray Nelson, USA—United States Military Academy, West Point, NY

1115 ARDEC's ROLE IN COUNTERING THE IED THREAT:

Ray Carr—ARDEC Counter Terrorism Technology Team Lead, U.S. Army, ARDEC, Picatinny Arsenal, NJ

1145 LUNCHEON

Sponsored by Lockheed Martin Company

1315 U.S. ARMY JOINT MUNITIONS COMMAND ACTIVITIES:

Jyujji Hewitt—Deputy to Commander, Joint Munitions Command, Rock Island, IL

1345 PICATINNY LABORATORY INITIATIVES:

Dr. Joe Lannon—Director US Army ARDEC, Picatinny Arsenal, NJ

1415 HIGHLY PRECISE MUNITIONS OVERVIEW:

Charles Kelly—Staff Specialist, Land Warfare & Munitions, OUSD (AT&L)

1500 NETWORKING REFRESHMENT BREAK

Sponsored by Whitney, Bradley & Brown, Inc.

1530 ARMY PEO MUNITIONS PROGRAMS PANEL:

Panel Chair: *Jim Sutton*—Deputy PEO Ammunition, Picatinny Arsenal, NJ

- *Chris Grassano*—PM Maneuver Ammunition Systems (PM MAS), Picatinny Arsenal, NJ
- *Colonel Ole Knudson, USA*—PM Combat Ammunition Systems (PM CAS), Picatinny Arsenal, NJ
- *Colonel Ray Nulk*—Office of the Project Manager for Close Combat Systems, Picatinny Arsenal, NJ

1630 MODELING AND SIMULATION FOR MUNITIONS DEVELOPMENT:

Don Carlucci—Chief, Analysis & Evaluation Division, Fuze and Precision Armaments Technology Directorate

1700 EVENING RECEPTION—HEAVY HORS D'OEUVRES

Sponsored by Raytheon Company

AGENDA

WEDNESDAY, 11 JUNE

0730 CHECK-IN / CONTINENTAL BREAKFAST

Sponsored by ATK

0830 NAVY INTEGRATED SPECIALTY SITE FOR GUNS AND AMMUNITION:

Mike Till—Transition Manager for Picatinny Arsenal, NJ

0915 NAVY ELECTROMAGNETIC GUN PROJECT:

Michael Elliott—Deputy Program Manager, Office of Naval Research

1000 NETWORKING REFRESHMENT BREAK

Sponsored by General Dynamics-OTS

1030 FORT SILL'S ROLE IN PRECISION FIRES:

Kirby Brown—Deputy to the Commanding General, U.S. Army Fires & Fort Sill, OK

1115 GUIDED MISSILES OVERVIEW:

Robert Kirby—Deputy Chief Engineer for Precision Fires Rocket and Missile Systems, Redstone Arsenal, AL

1200 LUNCHEON

Sponsored by Orbital Sciences Corp.

1330 ARMY AMMUNITION REQUIREMENTS:

Robert Grubbs—Deputy for Munitions, G3/7-Headquarters, Department of Army, Munitions G-3

Don Chrans—Headquarters Department of Army, Munitions G-8

1415 MUNITION LOGISTICS SUPPORT PANEL:

- *Colonel Michael Mc Bride, USA*—Deputy Commander/Chief of Staff, U.S. Army Ordnance Center & Schools, Huntsville, AL
- *CW5 Donald Dehnel, USA*—Senior Ammo Tech, Munitions System Manager's Office, Redstone Arsenal, AL
- *Al Galonski*—Chief Future Concept Division, Logistics Research Engineering Directorate, Picatinny Arsenal, NJ

1515 NETWORKING REFRESHMENT BREAK

Sponsored by General Dynamics-OTS

1530 MUNITIONS SAFETY:

Gary Carney—Director, US Army Defense Ammunition Center and School, McAllister, OK

1600 MQ-9 REAPER UNMANNED AERIAL VEHICLE:

TBD

1645 CLOSING REMARKS:

Andy McHugh—Vice-Chairman of the Board

ARMAMENTS TECHNOLOGY FIRE POWER FORUM COMMITTEE

PSA PROGRAMS CHAIR: Ginny Sniegou PSA PROGRAMS VICE CHAIR: CAPT Pete Murphy USN

SUMMER FORUM EVENT CHAIR: MG Paul Greenberg, USA (Retired)

DIRECTOR OF OPERATIONS & ADMINISTRATIVE CONTACT: Dawn Campbell

U.S. MILITARY WARFIGHTER REPRESENTATIVES: Col Gary Mausolf USAF, Col Bob Valin, USAF

LCDR Scott Wilson USN, LtCol Chuck Kelly USMC (Ret), LTC Ken Britt USA (Ret)

The background is a complex collage of military-related images. It includes soldiers in combat gear, various types of tanks and armored vehicles, and aircraft in flight. The overall theme is military capabilities and operations.

Field Artillery Capabilities Update

Mr. Kirby Brown

**Deputy to the Commanding General/ Director
Capabilities Development and Integration
Directorate**

System of Systems Capability



Desired Capability: Ability to rapidly and accurately locate and attack targets with the required operational responsiveness matched to desired effects (lethal and non-lethal) and the greatest efficiency.

To achieve this, Field Artillery needs these “enablers”

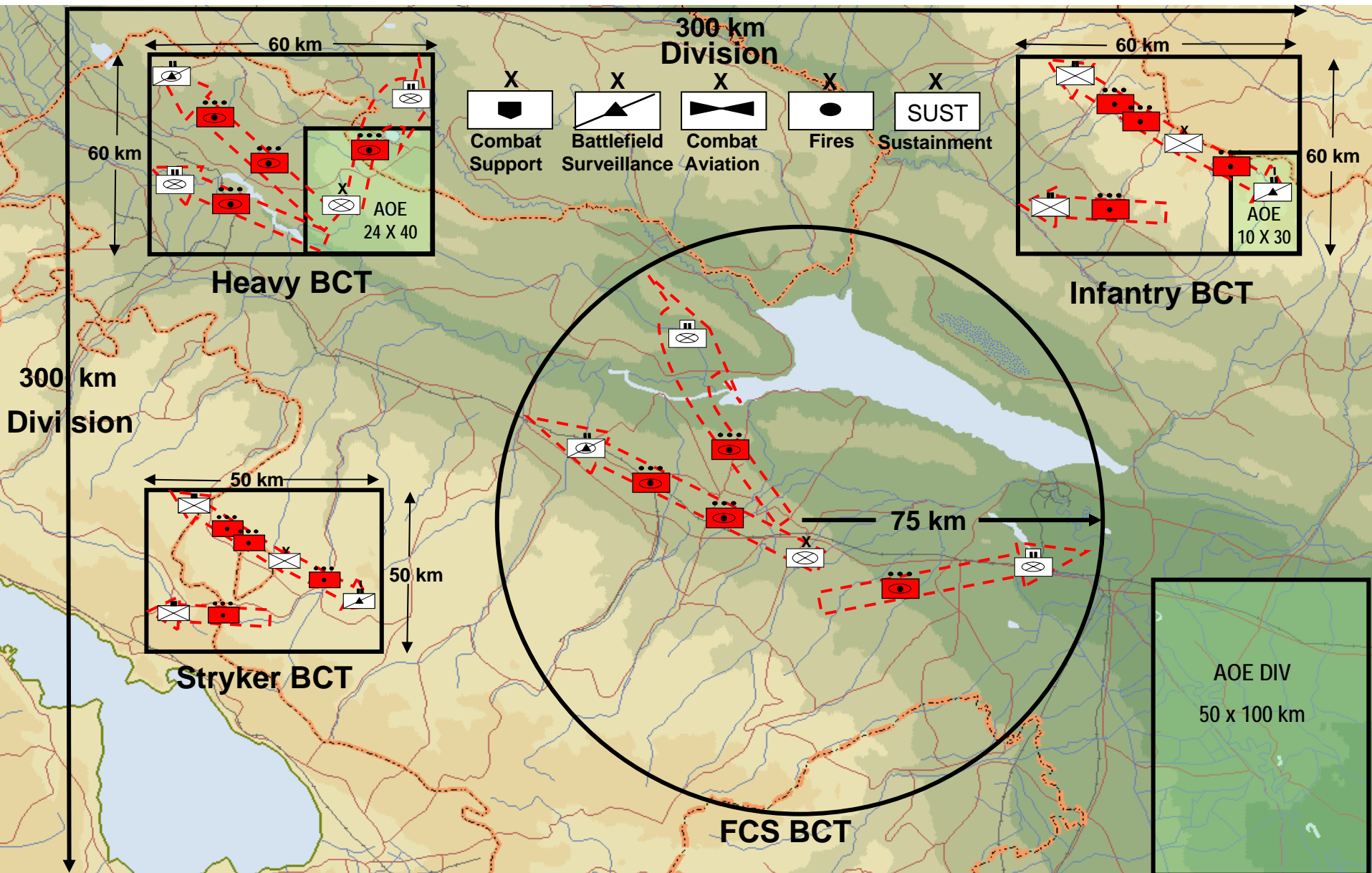
- *Target location error <10M at extended ranges, 360--mounted and dismounted*
- *Technical fire direction and limited tactical fire direction on all delivery systems*
- *Delivery systems that can rapidly emplace/displace with high rates of fire*
- *Accurate on demand, meteorological data to delivery system ranges*
- *All munitions with less than 50M CEP at all ranges*
- *Munitions that provide a variety of effects in any environment*



Our goal is to become a “Precision System of Systems”

The Future of Fires Begins Here

Conceptual Areas of Operation



Full Spectrum Capabilities



Dominant target today is personnel in various postures

TODAY
COIN

Challenge is to find capabilities for today that carry into the future--across the spectrum

Lethality Spectrum



What are the projected capability gaps in the future across the spectrum

What should we expect in an MCO of tomorrow

TOMORROW
Irregular Warfare to Major Combat Operations?



The Future of Fires Begins Here

Assessment and Way Ahead

"Precision System of Systems"



Fire Support
Sensor System



Lightweight Laser
Designator
Rangefinder

Locate and Designate

- <10M TLE mounted and stationary
- <5M TLE when aided with PSS-SOF
- Need JETS for dismounted operations



Improved
Positioning and
Azimuth Determining
System

Location and Direction

- Moving to "on board" capability
- IPADS for all other

Met



Profiler

- Target area capability
- Met on demand
- Moving to "embedded"

Computation



Advanced Field
Artillery Tactical Data
System

- Technical and tactical from same automation system
- Moving to on board technical
- Exploring limited on board tactical

The Future of Fires Begins Here

Assessment and Way Ahead

"Precision System of Systems"



Counterfire Location



Lightweight
Counter Mortar
Radar V3



Enhanced Q-36

- Theater demanding enhanced capability:
 - 360 acquisition
 - Better accuracy, range and probability of detection
- Fielding of EQ-36 and LCMR V3 close the gap
- Working to sustain readiness of current Firefinder fleet in the interim

Delivery Systems

M270A1



M119A2



Improved Crew
Protection HIMARS



Paladin
Integrated
Management
Howitzer



FCS - NLOS
Cannon



FCS - NLOS
Launch System

- Must maintain viability of current systems for many years
- Must address crew protection issues—especially towed systems with larger crews
- Must close gap with on board digitization for M119A2
- NLOS Cannon and LS are great systems but pose some challenges with crew size

The Future of Fires Begins Here

Munitions - Current Capability



Precision Guidance Kit

- Technology demonstration showed initial capability of 30M CEP
- Working form fit for 155mm and 105mm unique challenges
- Funded in POM



"More precise" area effects

Desired Future Capability

- *CEP < 50M for all munitions*
- *Enhanced lethality*
- *Greater efficiency*
- *Scaleable including non-lethal*

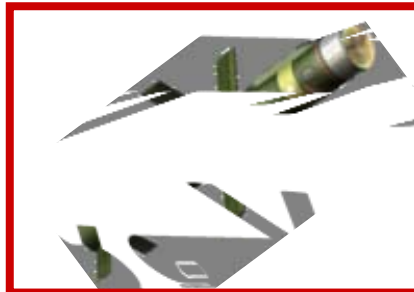


Guided MLRS - Unitary

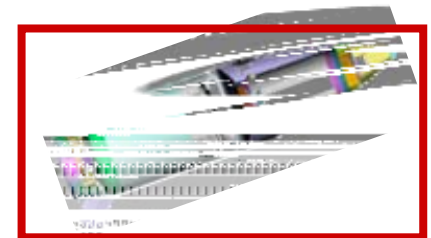
< 10m CEP for point target attack



Excalibur



Precision Attack Missile



ATACMS Unitary

The Future of Fires Begins Here

GMLRS-Unitary Rocket



737 Total Rockets Fired As Of 3 June 2008

Who Shoots GMLRS-U:

US Army	587	79.65%
USMC	24	3.26%
UK	126	17.10%

US Army Missions

Who Requests GMLRS-U:

Army	372	63.37%
Marines	121	20.61%
Other	94	16.02%

How GMLRS-U is employed:

Troops In Contact	183	31.18%
Pre-Planned	404	68.82%

Environments GMLRS-U is employed:

Urban/COIN	558	95.06%
Other (TD/Test)	29	4.94%

Capability Gap: Persistent, responsive, all-weather, rapidly-deployable, long-range, surface-to-surface, precision-strike capability.

Description

- GPS-Augmented Inertial Guidance
- 200lb-Class HE IM-Compliant Warhead
- Multi-Fuze Selection (Point Detonating, Delay, Proximity)
- 15-70km Range



Current Targets

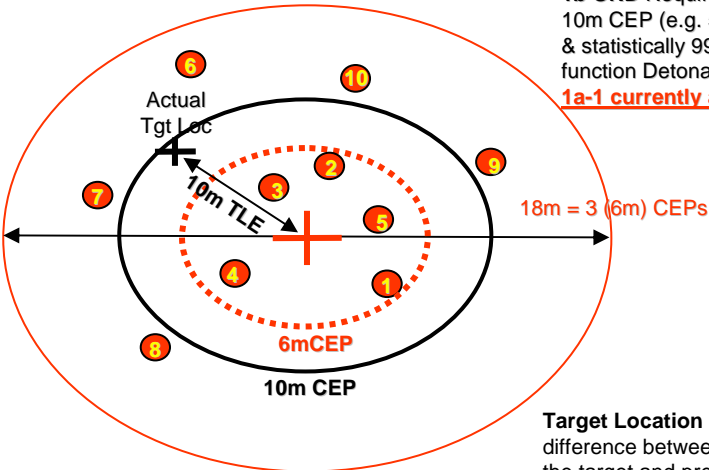
- Precisely Located/Mensurated Point targets
- Congested/Complex Urban Targets
- Targets in Areas Where Collateral Damage is of Concern

Effectiveness/Reliability

- BDA Shows High Level of Effectiveness
- Rare Reports of Minor Collateral Damage
- Reliability of US Army Missions: 98.63%



Excalibur



1b ORD Requires Excalibur achieve 10m CEP (e.g. 50% land within 10m & statistically 99.8% of rounds that function Detonate within 3 CEPs i.e 30m)
1a-1 currently achieves 6m CEP

Target Location Error (TLE) the difference between the actual location of the target and predicted target location.
Circular Error probable (CEP) the radius of a circle into which a warhead, missile, bomb or projectile will land at least 50% of the time.

Depicts 10 rounds fired at a target located with a device with 10m TLE accuracy w/6m CEP. Expect 50% of rounds to fall within one CEP.
 + = Actual Aim point to target due to TLE

Trends:

Target Types: Structures

of Rds/TGT: 2

Firing Platforms: Paladin & M777A2



Mission Roll Up

US-OIF

Rounds Delivered = 275
 MSNs Fired = 30
 Rds Fired = **50**
 Hits w/Detonation = 44
 Flew to BIP = 4
 Hit w/no high order = 2
 Unserviceable = 3
 Rounds Available = 208

54 Total Rds Fired
48 Hits
88.8% Reliability

US-OEF

Rounds Delivered = 72
 MSNs Fired = 2
 Rds Fired = 2
 Unserv. = 0
 Hits w/Detonation = 2
 Rounds Available = 70

Canada-OEF

Rounds Delivered = 27
 MSNs Fired = 2
 Rds Fired = 2
 Unserv. = 1
 Hits w/Detonation = 2
 Rounds Available = 25

Issues:

- PEFCS (service life extension in theater)
- EPIAFS PIK Upgrade (still on-going in theater)
- Blk 1a-2 IOTE Delay probable (March 2009)
- Blk 1b Request for Proposal published 7Mar08
 - Blk 1b CEP change 10m (T) 6m (O)

The Future of Fires Begins Here

Assessment and Way Ahead

"Precision System of Systems"



✓ View our munitions capability gaps in this priority:

- Precision
- Lethality
- Range



- ✓ Distributed operations, precision munitions and rapid delivery may redefine the massing of fires
- ✓ Must have greater efficiency without sacrificing effectiveness
- ✓ Continue to explore alternatives to cluster munitions
- ✓ Need to increase the scalability of the terminal effects of our munitions
- ✓ Non-lethal effects like visual and infra-red illumination are still important
- ✓ Considerably greater gap in the indirect fires capabilities of the IBCF when compared with the HBCF or SBCF that we are working to reduce
- ✓ "Near precision" capabilities like PGK have a place—TLE is rapidly getting better but sometimes may not be there

Precision munitions have significantly added to our contribution to the current fight

The Future of Fires Begins Here

Summary



- COIN environment has highlighted some unique challenges and capability gaps
- Most of our challenges are faced by many of our likely coalition partners
- Must also address capabilities for Full Spectrum Operations
- Current and programmed systems and munitions close or mitigate many of those gaps but we aren't there just yet
- Significant challenge to maintain the readiness of current capabilities while awaiting next generation capabilities
- Supplemental funding has been and remains very important to modernizing



Enabling Soldiers with the required capabilities—today and tomorrow



U.S. ARMY DEFENSE AMMUNITION CENTER (DAC)

**Mr. Gary Carney
Director**

**(918) 420-8901/DSN 956-8901
gary.carney@us.army.mil**



★ ***JMC – Ready – Reliable - Lethal***

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Defense Ammunition Center

(DAC Knows Ammo)



MISSION

Center for ammunition logistical support and knowledge; responsible for explosives safety, logistics engineering, transportability, training, doctrine, demil technology, supportability, reliability, technical assistance and career management. Support all ammunition operations and activities from development through disposal.

CORE FUNCTIONS

- Supportability
- Transportability
- Reliability
- Safety
- Technology (demil lead)
- Training/Knowledge Management

CUSTOMERS

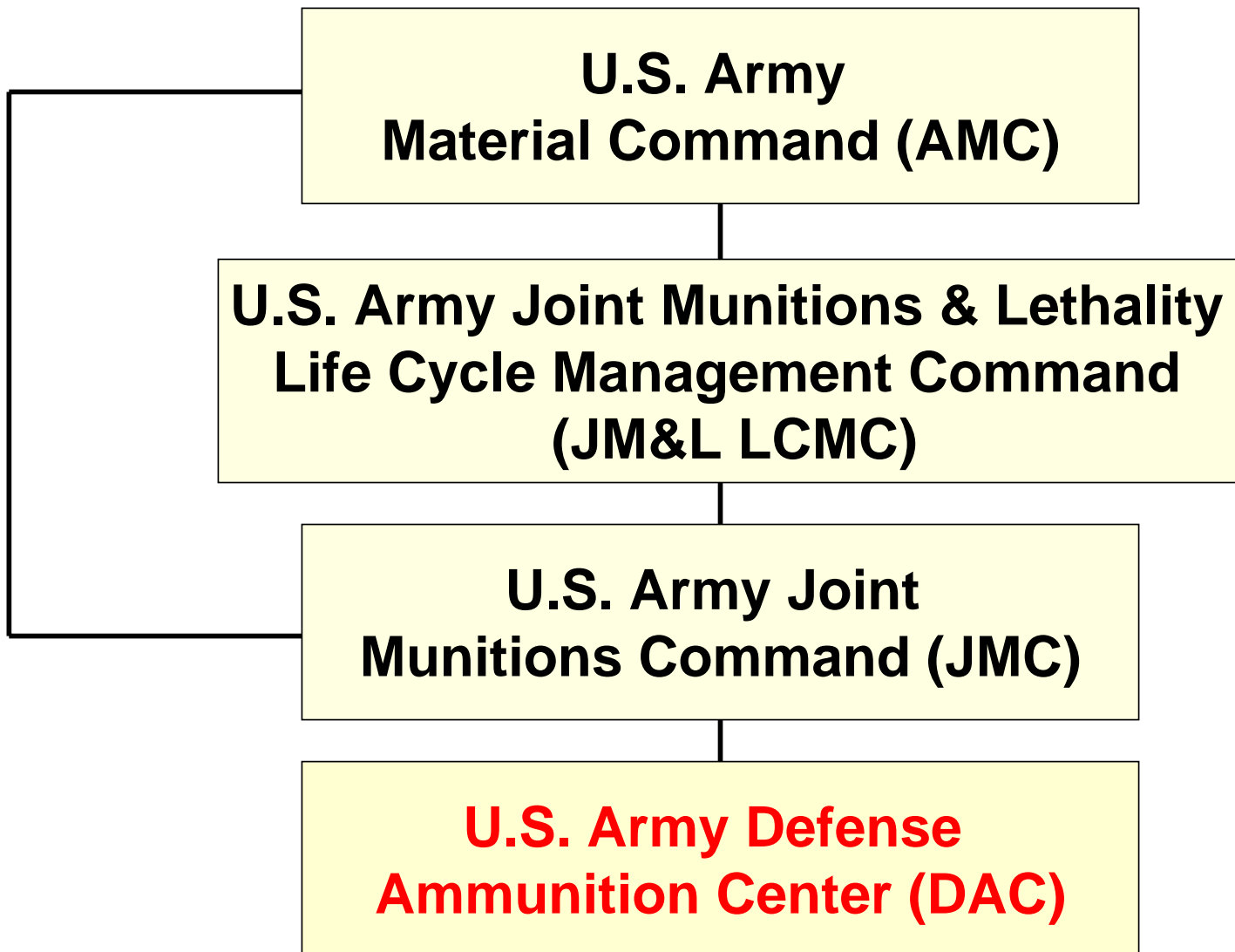
- Department of Defense
 - DDESB
- Department of Army
 - G-4
 - Corp of Engineers
 - Combat Readiness Center
- PEO Ammunition (LCMC)
- AMC/FORSCOM/TRADOC
- AMCOM
- Joint Munitions Command
- ARDEC
- National Guard Bureau/ Army Reserve
- Coast Guard
- Navy/Marine Corps/Air Force
- International/Foreign Military
- Private Industry/ Academia
- Other Federal Agencies

FACTS

- Located at McAlester Army Ammunition Plant
- 9001:2000 ISO certified organization since 2002
- Operating budget \$64.9M
 - OMA (Direct) Funded – \$26.3M
 - Reimbursable – \$33.4M
- 219 full-time permanent civilian employees
- 59 QASAS/Ammunition Managers Interns



Organization Structure





Defense Ammunition Center

(DAC Knows Ammo)



Technology Directorate

- Joint demil technology solutions
- PM Demil Enterprise Lead for DoD Conventional Ammo/Large Rocket Motor Demil R&D Technology
 - Munitions parts make-up: Munitions Items Disposition Action System (MIDAS)

Training Directorate

- Ammunition Professionals Training
 - 35,000 DoD military/civilian personnel
 - HAZMAT Training
 - QASAS/Ammo Manager training
 - Knowledge management services
- Distance Learning & Web based Tng
 - Arms Ammo & Explosives web

Engineering Directorate

- (Develop, Design, Fabricate)
- Engineering assistance for:
 - Ammunition Logistics
 - Ammo Transportability
- Packing/Tiedown Drawings & Testing
- Ammo Peculiar Equip (APE)

DAC provides logistical support to the Warfighter through five integrated mission areas

Operations Directorate

- HQDA G4 Ammunition Review/Technical Assistance to Army ammo activities
- DA career programs QASAS and Ammo Mgrs
 - Ammunition Logistics publications
 - (Yellow Book)
 - AmmoHelp Hotline
- Answer Soldier's/Unit's questions and issues on ammo related subjects

US Army Technical Center for Explosives Safety

- U.S. Army Explosives and Chemical Agent Safety programs
 - Army/Joint Hazard Classifying Authority/System
- Investigate/Assess Army Accidents – Assist Units with investigating Explosive/ Ammunition accidents
- Approve Army Explosive site plans – Help resolve issues

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Training Directorate



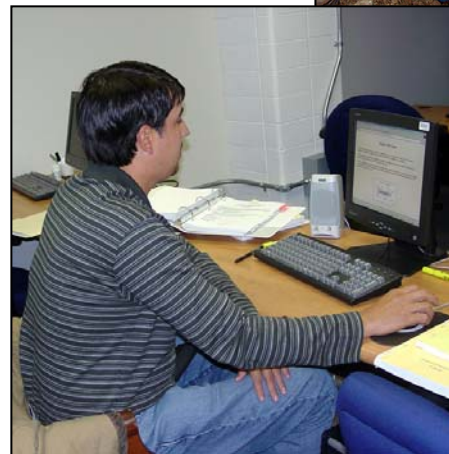
✓ **Mission:** To provide ammunition-related training and knowledge management services for Department of Defense (DOD) military and civilian personnel.

✓ **Core Capabilities:**

- Ammunition training tailored to meet the needs of the Joint Services
- Distance learning training products & job aides
- Worldwide Knowledge Management (KM) services
- LMP/SAP expert user support

✓ **Current Initiatives:**

- 29,454 military & 6,229 civilian students trained in FY 07
- Arms Ammo & Explo (AA&E) portal/OSD Strategic Plan action items
- Knowledge harvesting & Ammo Communities of Practice (CoP) on AKO/DKO
- Ammo Supply Point (ASP) concept of operations/task matrix



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Technology Directorate



- ✓ **Mission: Develop Safe, Efficient, Economical, and Environmentally-Acceptable Demil Solutions**
- ✓ **Core Capabilities:**
 - **DoD Munitions Demilitarization Technology Development and Transition Synchronization**
 - **MIDAS Demil Operations Support**
 - **Munitions Demil Environmental and Scientific Services**
- ✓ **Current Initiatives:**
 - **Munitions Demil R&D IPT – Analytical Project Prioritization Process**
 - **Transitioning Robotic Download of ADAM Mines at McAlester AAP – FY 08**
 - **Near Infrared (NIR) Spectroscopy Propellant and Explosives Scanners**
 - **MIDAS Website – Constituent Data, Demil Process Maps, Environmental Reporting**
 - **Global Demil Symposium and Exhibition – Salt Lake City/Tooele Army Depot, UT – May 2008**



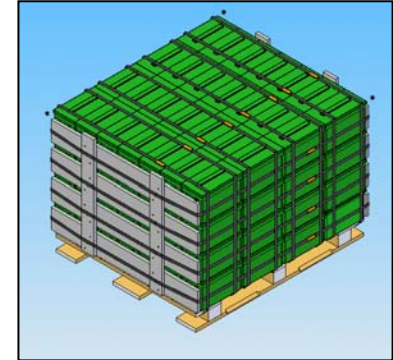
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Engineering Directorate



- ✓ **Mission:** Provide engineering assistance to DOD, HQDA, AMC, and SMCA for ammunition wholesale and retail operations; i.e., receipt, storage, issue, transportation, maintenance, surveillance, demilitarization, and modernization.
- ✓ **Core Capabilities:**
 - Design of methods and procedures for safe handling, unitization, storage and transportation of ammunition.
 - Design and development of equipment to support life-cycle management of ammunition.
 - Conduct testing to ensure standardized, safe methods and procedures for movement of ammunition.
- ✓ **Current Initiatives:**
 - Munitions Power Projection Platform (MP3)
 - Joint Modular Intermodal Distribution System (JMIDS)
 - Ammunition Peculiar Equipment
 - APE 1996 – Automated Tactical Ammunition System (ATACS)
 - Desert Optimized Equipment (DOE)
 - APE 1411 – Spent Small Arms Ammunition Granulator
 - Korean Demilitarization Facility
 - Ship Motion Simulator (SMS)



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Operations Directorate



✓ Mission:

- Worldwide Ammunition Review and Technical Assistance Program (AR 700-13) for DA G-4
- Manage two DA career programs providing trained QASAS and Ammunition Managers (1000 worldwide careerists)

✓ Core Capabilities:

- Ammunition Logistics Reviews (20+ on-site per year)
- Ammunition logistics publications and guides (Yellow Book; TB 43-0250; Unit Ammo Guide)
- On-Site technical assistance (19th SCE/6th Ord Bn Korea; Armed Forces of the Philippines; Singapore Armed Forces)
- QASAS mandatory mobility program

✓ Current Initiatives:

- AmmoHelp Hotline (4,000+ questions since FY 02)
- Deployment of QASAS and AMs in support of OIF/OEF
- Annual Digest-Logistics Review trend analysis
- Pocket-size Ammo Do's and Don'ts cards for deployed forces



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US Army Technical Center for Explosives Safety



✓ Mission:

- Preserve warfighting capabilities and enhance the Force by providing safe and healthy environment for Soldiers, civilians, families, and contractors through execution and management of the U.S. Army Explosives and Chemical Agent Safety Programs.

✓ Core Capabilities:

- Hazard Classifying Authority
- Explosives Site Plan Approval Authority
- Investigate/Assess Army Accidents
- Technical Assistance

✓ Current Initiatives:

- Establish Theater Presence
- Explosives Safety Assistance Visits
- Field Commander's Seminar
- Automated Site Planning



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US Army Technical Center for Explosives Safety Mission



To preserve warfighting capabilities and enhance the Force by providing a safe and healthy environment for Soldiers, civilians, families, and contractors through execution, and management of the U.S. Army Explosives and Chemical Agent Safety Programs.



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Why We Need Explosives Safety



- ✓ 17 July 1944, Port Chicago, CA
- ✓ 4,606 tons of ammunition
- ✓ 4.2M lbs NEW
- ✓ 320 persons killed, 202 injured
- ✓ Damage to 46 miles
- ✓ Two cargo ships, locomotive and 16 boxcars destroyed
- ✓ E.A. Bryan, pier and surrounding structures completely destroyed





Doha, Kuwait – July 1991



Debris Field, Doha, Kuwait British HQ in background



Track Park, Doha Kuwait

- ✓ Uploaded vehicles closely grouped
- ✓ Caused by FAASV heater fire
- ✓ Assets lost
 - 4 Abrams tanks
 - 7 M109 Howitzers
 - 7 FAASV's
 - 4 AVLB
 - 40 smaller vehicles (HMMWVs, CUCVs, etc)
- ✓ 50 injuries initially; 3 fatalities during clean-up



Destroyed M109 Howitzers at Doha, Kuwait



Near Mosul - May 2003



- ✓ 12 Warehouse complex
 - 11 Stored CEA
 - 1 used as troop billets
- ✓ QASAS advised Command to have troops vacate
- ✓ Troops did vacate, not happy
- ✓ CEA exploded one week later



Kirkuk Munitions Storage Area (MSA) - Jun 2004



- ✓ Mortar hit near the MSA
- ✓ Caught the high grass on fire
- ✓ Went through the area exploding outdoor storage - 200K+NEW



FOB Falcon – Oct 2006



- ✓ Fire got into ammo container
- ✓ Excess ammo present -
Ammo stored for weapon systems not present (155 mm)
- ✓ Contractors had billets close to the ATHP - CHUs flattened by blast overpressure
- ✓ T-Wall falsely believed to give protection to inhabited areas and on base roads – IBD is required for blast protection



Major Program Components

ESTABLISHED 1988

GOSC

DIRECTOR OF ARMY STAFF APPROVAL

DAESC

**DIRECTOR OF ARMY SAFETY -
CHAIR MAJOR COMMAND
COUNCIL**

EDES

**ARMY MATERIEL COMMAND
DEPUTY CG - MAJOR
ISSUES/SPECIAL STUDIES**

USATCES

**DIRECTOR OF DAC/USATCES -
TECHNICAL SUPPORT**



USATCES Functions



- ✓ **Policy and Regulatory Development**
- ✓ **Explosives and Chemical Agent Safety Site Plans**
- ✓ **Hazard Classification**
- ✓ **Technical Assistance/Guidance**
- ✓ **Accident Investigation Support**
- ✓ **Explosives Safety Assistance Visits**
- ✓ **Explosives Safety Risk Assessments**
- ✓ **Department of Army Explosives Safety Council Support**
- ✓ **DOD/DA Working Groups**



Technical Assistance to the Theater



- ✓ **USATCES Team (2 – Iraq / 1 – Afghanistan) 179 days**
- ✓ **Three USATCES personnel deployed Jan/Feb 2008**
- ✓ **Assigned to 401st and 402nd AFSB**
- ✓ **Established Offices**
- ✓ **Networking in Theater**
- ✓ **Providing Explosives Safety Technical Assistance**
 - **Site Plans**
 - **Licenses**
 - **Risk Management**



Army Explosives Mishap Criteria

“An unplanned explosion or functioning of explosive materiel or devices (except during combat). This includes inadvertent actuation, jettisoning, and releasing or launching of explosive devices. It also includes mishaps that result from off-range impacts of ordnance.” (DODI 6055.7)



FY 07 Army Explosives Mishap Trends



- ✓ **FY07 Explosives Mishaps**
 - **Class A – 25**
 - **Class B – 17**
 - **Class C – 34**
 - **Class D – 0**
 - **Other – 60**
 - **Total – 136**
- ✓ **Small Arms Most Common Munitions Type**
- ✓ **Human Error Most Common Cause**
- ✓ **Training and Handling Most Common Operations**
- ✓ **Weapons-Handling Incidents in Theater Remain Area of Concern**



Soldier Loses Arm In Grenade Accident



- ✓ Status of lower leg still in question
- ✓ Two additional soldiers seriously hurt
- ✓ Soldiers were removing tape from grenades
- ✓ FM 3-23.30 – NO TAPING GRENADES



Why do Soldiers Tape Grenades?

- Mitigate Noise
- Don't Trust Safety Features
- Urban Myths
- Common Practice



Soldier Permanently Blinded In Fiery Blast...4 Others Injured



- ✓ **Combat Engineers dispose of excess C-4, Det Cord, etc. in an open fire**
- ✓ **Soldiers with multiple injuries**
 - **1 lost both eyes;**
 - 2 w/1 eye damaged**
 - **Punctured chest wounds**
 - **Facial, body, and extremity lacerations**
 - **All w/ruptured ear drums**
- ✓ **1-2LT, 2-SFC's, 1-SGT, 1-PFC**



What Went Wrong?

- **Complacency?**
- **Avoiding Turn-In Paperwork?**
- **Didn't Follow Procedures!**
- **Not Wearing PPE!!**
- **Accepted Practice?**



M2 Explodes....Again



- ✓ During a pre-convoy function check, a soldier was injured when the .50 cal round in their M2 machine gun exploded
- ✓ Likely cause is another Head Space and Timing error
- ✓ The soldier had been trained on Head Space and Timing



Why was Head Space & Timing Wrong?

- Training was long ago
- Worn or damaged weapon
- Leaders didn't check soldiers proficiency





HMMWV Destroyed by Fire



- ✓ Soldiers escape without serious injury
- ✓ Caused by burning propellant bags too close to vehicle
- ✓ Only available fire extinguishers found inside burned vehicle



What went wrong?

- Didn't follow established procedures
- Leadership not engaged
- Lack of preparation



Mishandling of 25mm Cartridge Results in Soldier's Death



- ✓ Transferring of linked 25mm from a Bradley to a Gator
- ✓ Primer strikes pointed or rough object...round functions
- ✓ Cartridge case fragments rip through unprotected torso



What went wrong?

- Leadership not engaged
- Linked too many belts together (100+ rounds)
- Didn't follow established procedures



Soldier Killed in Bleachers



- ✓ Negligent discharge of M2 Machine Gun
- ✓ Live .50 cal round inadvertently introduced into dummy munitions
- ✓ Accident occurs during dry fire exercise



What went wrong?

- Leadership distracted
- Basic Training Soldiers recovered live round from earlier exercise
- Soldiers did not recognize live vs. dummy round
- Didn't follow established procedures... Linking not allowed by Soldiers



Cardinal Principle

- ✓ Exposing the **MINIMUM** amount of personnel
- ✓ To the **MINIMUM** amount of explosives
- ✓ For the **MINIMUM** amount of time



DAC-USATCES Website

- ✓ DA/DDESB Policies
- ✓ Deployment Information
- ✓ Training/Course Information
- ✓ Explosives Safety Toolbox
- ✓ Explosives Safety Bulletins
- ✓ AmmoHelp





Explosives Safety Toolbox




- ✓ **Web based on AKO**
- ✓ **Anyone with a .mil address can access**
- ✓ **131 different files currently available**
 - **Messages**
 - **Checklists**
 - **Publications**
 - **Forms**
 - **Templates**



Explosives Safety Bulletin




- ✓ Published Quarterly
- ✓ Special Editions dedicated to specific areas
- ✓ Electronically distributed to approximately 6000 individuals
- ✓ Available online at our website



EXPLOSIVES SAFETY BULLETIN

U.S. Army Technical Center for Explosives Safety (USATCES)
McAlester, OK 74501



Special EditionOctober 2006

AMMUNITION BARRICADING GUIDE

The US Army Technical Center for Explosives Safety has assembled this guide to provide commanders, safety personnel, QASAS, and other interested parties with a short description of a variety of approved barricading methods for ammunition storage sites, along with a discussion of their respective benefits and drawbacks.

A barricade is defined in DA Pam 385-64 as "an intervening barrier, natural or artificial, of such type, size, and construction as to limit in a prescribed manner the effect of an explosion on nearby buildings or explosives." In the case of ammunition storage sites, barricades are used to prevent prompt propagation between stacks of explosives from low angle, high velocity fragments produced in an explosion. However, this does not completely protect surrounding ammunition storage sites from later propagation due to high angle fragments or firebrands.

Ammunition storage sites require intermagazine distance (IMD) separation from other ammunition storage sites. The use of barricades can reduce this separation distance, and decrease the footprint of an ammunition storage site. The presence of barricades does not reduce required separation distances (inhabited building distance (IBD) and public traffic route (PTR)). Also, regardless of the presence of barricades, intermagazine distance separation is not sufficient to assure total non-propagation or the serviceability of surrounding ammunition stacks following an explosives accident.

Besides the normal default distances for unbarricaded and barricaded IMD separation, there are specialized barricading systems that can reduce the IMD separation requirement even further. However, these methods, which have received approval for use as a result of testing and analysis, require the application of additional restrictions or limitations in connection with their use.

In order to compare and contrast these barricading methods, the following examples use a net explosive weight (NEW) of 30,000 pounds of hazard division (HD) 1.1 munitions for each individual storage area, or (for those sites to which Basic Load Ammunition Holding Area (BLAHA) criteria apply), a NEW of 8,800 pounds.

IN THIS EDITION:		Example Option 1.....	7
Unbarricaded IMD.....	2	Example Option 2.....	8
Barricaded IMD.....	3	Example Option 3.....	9
Specialized Barricading Methods.....	4	Example Option 4.....	9
ARMCO Reinforcements.....	4	Example Option 5.....	10
Barricaded Storage Modules.....	5	Example Option 6.....	10
Container Barricades.....	6	Example Option 7.....	10
Hybrid Plans.....	7	Example Option 8.....	11
Safety Distance External to the Storage Sites.....	7	Example Option 9.....	11
		Storage Option Matrix.....	12
		Pros & Cons.....	12

continued on next page.....



Explosives Safety Tools & Resources



- ✓ **AMMOHELP – Response within 24 hours**
 - Centralized source ammunition technical information
 - Web based (automated form) – www3.dac.army.mil
 - Email – MCAL.DAC.AMMO.HELP@conus.army.mil
 - Toll-free hotline – 1-877-668-2840



Defense Ammunition Center



**Need Ammo or Explosives Safety
Help:
Call on DAC because:**

“DAC KNOWS AMMO”

WEB Site: <https://www3.dac.army.mil/ammohelp>

EMAIL: MCAL.DAC.AMMO.HELP@conus.army.mil

COMM PHONE: 1-877-688-2840

Questions?



U.S. ARMY ARMAMENT, RESEARCH,
DEVELOPMENT & ENGINEERING CENTER



Malcolm Baldrige
National
Quality
Award

2007 Award
Recipient



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

ARDEC's Role In Countering the IED Threat

Mr. Ray Carr,
ARDEC Counter Terrorism Technology Team



- Mission, Approach, Introduction
- Some Specific Areas of Influence
 - Explosive Detection
 - Armor
 - EOD tools
 - Training





ARDEC Counter Terrorism Technology Team



MISSION: Act as the ARDEC Program Manager to:

- **RAPIDLY DEVELOP AND FIELD** appropriate technologies to assist the warfighter in countering the Asymmetric threat.
- Develop strategy that leads to C-IED & C-Sniper system acquisitions, **TRANSITIONS TO PMS**, and create Programs of Record.
- To every extent possible, **DEVELOP DUAL USE TECHNOLOGIES**

RESOURCES:

- \$10M investment over the past 4 years
- \$35M annually customer funded C-IED efforts.
- Over 80 engineers and scientists currently work on 20 C-IED and Counter Sniper projects, partnered with academia and industry.



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Enemy IED Activities

(Simplified Schematic)



Funding, Recruiting, Training, Planning

Strategic

Leadership, Planning,
Training

Tactical

Supplies

Engineering,
Manufacture

Predict/Prevent
Detect

Neutralize
Mitigate

Monitor,
Detonate

**Greatest effect is realized by disrupting
early life cycle activities**

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Battle Rhythm...

- Monday – RDECOM Counter IED Task Force
- Tuesday
 - CG AMC Operations Brief (AFSB Updates)
 - JIEDDO Line of Operation
 - STAT Team Bi-Weekly Teleconference
- Wednesday
 - RDECOM Current Operations IPT
- Thursday
 - ARDEC GWOT Project Review
- Friday
 - NSA Counter IED IPT
 - MNF-I Tech Solutions



MNC-I STACA

CJTF-82 STACA

AMC- STAT 18

TF-TROY & TF-PALADIN

402 AFSB



**PEO-AMMO, PM IEDD/PF
JIEDDO, REF
TRADOC**

**Visit units prior to deployment
29 Palms, NTC & JMTC
“Dusty Boots Council”**

Defeat the Device

EOD Tools
Directed Energy Systems
Armor
Buried IED Detection
Base Defense

Attack the Network

Surveillance Sensors
Cache Detection
Explosive Detection
TTL

Train the Force

Pyrotechnic Training Devices
Virtual Training
Surrogates & Simulators



Rapid Prototyping Facility



Explosives Detection Laboratory



Davidson Advanced Warhead Development Facility



Acoustics Technology Laboratory



Fuze, S&A, Telemetry



Armament Software Engineering Center

- Newly completed explosive test bed facility for trace or bulk detection
 - Conductive floors, explosion proof electrical
 - Clean room, laboratory
- Access to military, foreign, commercial and improvised explosives
- High capacity storage bunkers
- Analytical lab for manufacture and identification of explosives
- Qualified personnel with many years of explosives experience
 - Trace & bulk detection
 - Foreign sample analysis
 - Formulations, manufacturing
 - Testing & analysis, handling and storage
- EOD/ Foreign material exploitation experience
- K9 Proficiency program



Evaluate & Validate

- System performance
- Sensitivity / Selectivity
- Analysis time
- Ease of use
- Covertness
- Real-time analysis
- Maximum Throughput
- Minimize peripherals
 - e.g. PDA size display
- Durability & High Temp operation
- Key background materials
 - Clothing, Building, Vehicle
- Standoff potential



Explosive Detection System Architecture

Hardware / Software

Bldg 92, 31, 95



Excitation Source

Bldg 95, 407, 329

— Laser

— Acoustic

— Mechanical



Interrogation Target

Bldg 3028,
3029, 1029

— Military

— Commercial

— HME



Signal Processor

Bldg 407

Detector / Spectrometer

Bldg 3022

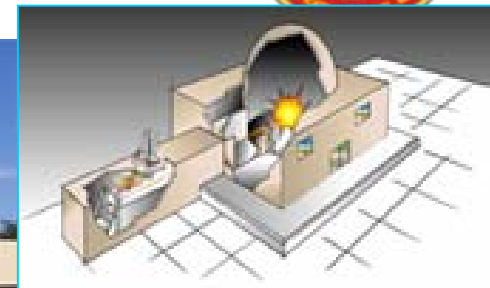
Collector

Bldg 95, 407

— Optical
— Vibrometer



IMG



Objectives:

Develop Armor Recipes

Defeat multiple threats

Qualify a Lightweight Armor Solution (2 Designs) at ATC

Using IMG as Baseline Vehicle for Integration

Partnerships with ARL and Industry

- Enhance IED detection through TALON control, video and power upgrades
- Enhance IED Neutralization by extending TALON life and control



- Access and Disrupt VBIED's
- Designed for ease of use in field
- Use fielded ammunition items



- Training
 - Situational training
 - Adaptive Thinking and Leadership
 - Future Soldier Trainer
 - Installation Force Protection
 - IED Virtual Trainer
 - Robot and equipment trainers
 - NBC Dismounted Equipment Trainer
 - EOD TALON Trainer
 - SWORDS Trainer
 - PackBot Trainer: EOD and CBRN
 - Shoulder launched weapons
 - Javelin Basic Skills Trainer





AMERICA'S ARMY EOD ROBOT TRAINER



- Provide a realistic training environment to enable soldiers to fine tune their operating skills with out the use of an actual robot
- Provide virtual operation of the PACBOT MTRS and TALON MTRS robot platforms.
- Able to add additional robot platforms as needed by the EOD community.
- Virtual Joystick must utilize the same type controls as the actual robot



THE OFFICIAL U.S. ARMY GAME

AMERICA'S **A★A** ARMY



- Scenario Training & replay recent events
- Equipment Training (e.g. TALON)
- Reinforce TTPs
- Installation Security, Emergency Response, Threat Recognition
- Interact as spectator or active participant



- ARDEC Has a Diverse Talent Pool and facility infrastructure that can rapidly concept and prototype solutions to mitigate an ever changing threat.
- ARDEC Civilians & Military provide invaluable in-theater New Equipment Training (NET), System Technical Support, Staff AMC FAST.



....Focused on our Ultimate Customer - the Warfighter

Questions?

Raymond E. Carr

raymond.e.carr@us.army.mil

(973) 724-5010



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

The Evolution of
Artillery for Increased
Effectiveness

June 10-11, 2008

Evolution of Artillery for Increased Effectiveness



Presented at:

Armaments Technology Firepower Forum

Contributors:

Fred Scerbo (L-3), Steve Floroff (ARDEC),
Adam Scanlan (ARDEC)

Presented by:

Dominick DeMella

Chief NLOS Cannon Artillery Division

ARDEC, Picatinny Arsenal

- To destroy, neutralize or suppress the enemy by cannon, rocket or missile fire ensuring the integration of all supporting fires in a combined arms operation
- Most lethal form of land based armament often referred to as:
 - *“King of Battle”*
 - *“God of War”*
 - *“Ultima Ratio Regum”*
 - *“The Final Argument of Kings”*
 - *“God Fights on The Side With the Best Artillery”*
 - *“I do not need to tell you who won the war, you know, Artillery did.”*

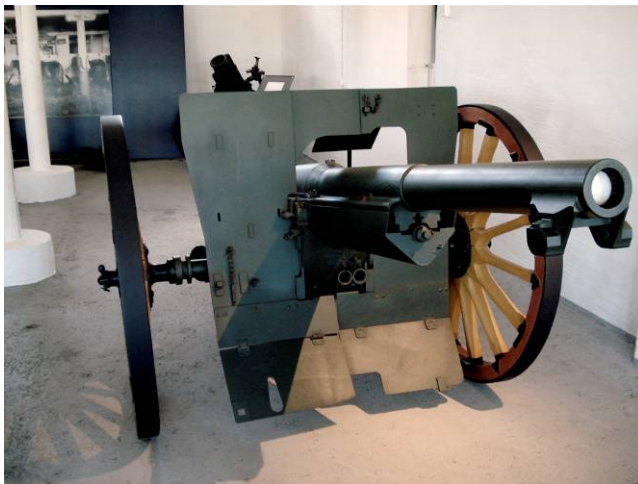
To provide an overview of historical highlights in the Development / Evolution of artillery and provide a snap shot of future trends



M777A1

1897 French 75 Fielded

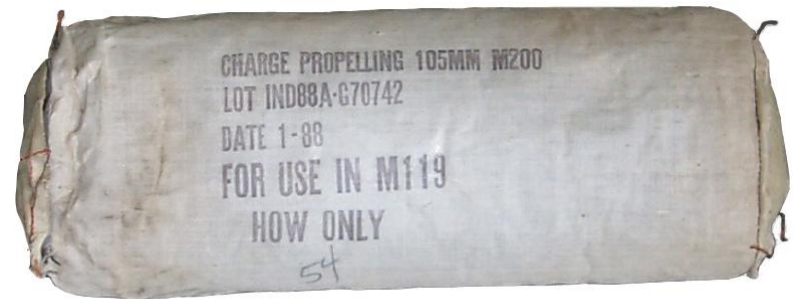
- Hydraulic Recoil System
- Effective Breech loading (Nordenfeld Breech)
- Modern Sight
- Self contained firing mechanism
- Fixed Shell + Cartridge Ammunition



- Black Powder
 - Low Power
 - Smoked
- Gun Cotton (Nitrocellulose)
 - More Powerful than Black Powder
 - Smokeless
 - Unstable
 - Burns Hot
- Double Based Powders
 - Nitrocellulose + Nitroglycerin
 - More Powerful than Gun Cotton
 - Smokeless
 - More stable than Gun Cotton
- Triple Based Powders
 - Nitrocellulose
 - Nitroglycerin
 - Nitroguanodine

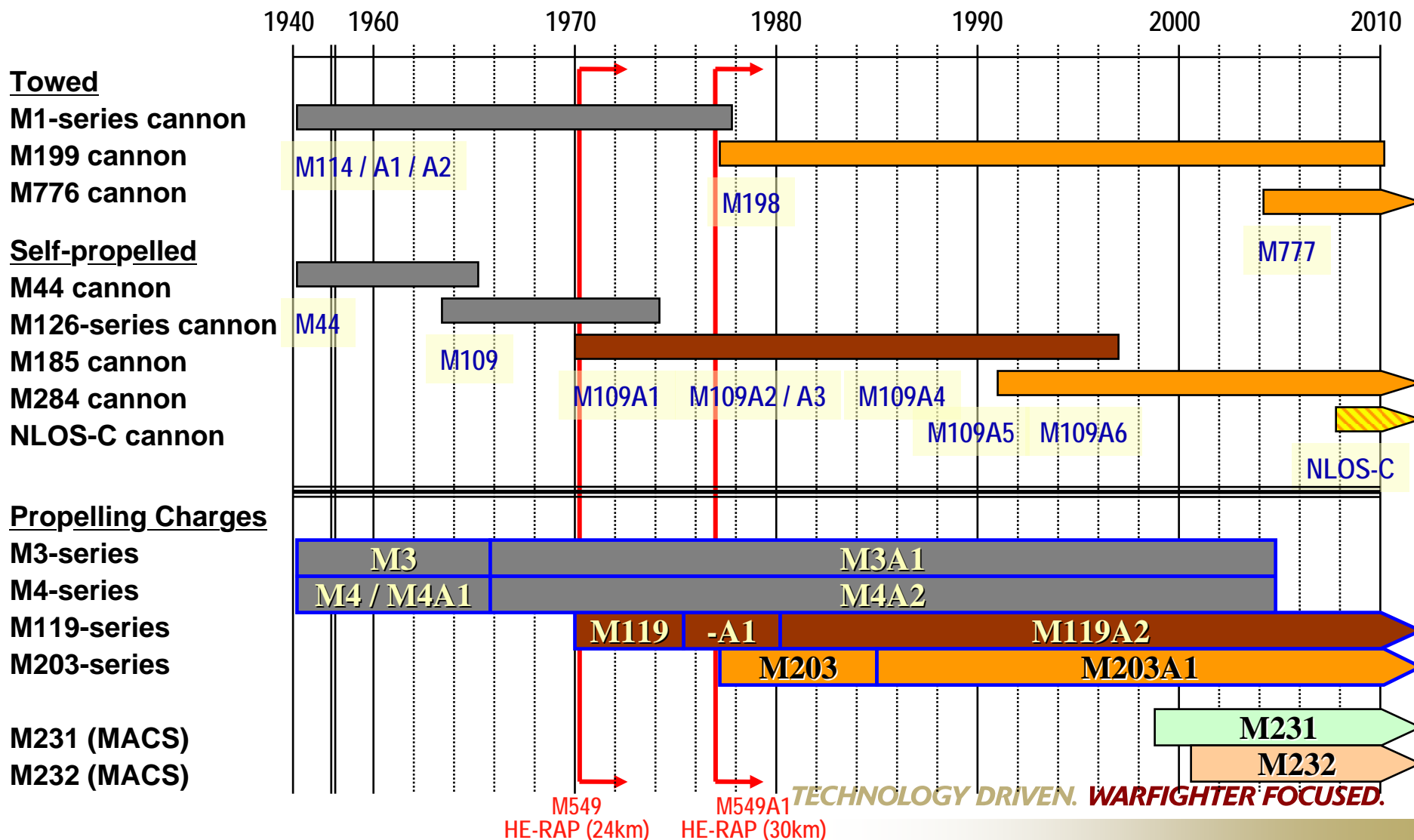


M67 Propelling Charge

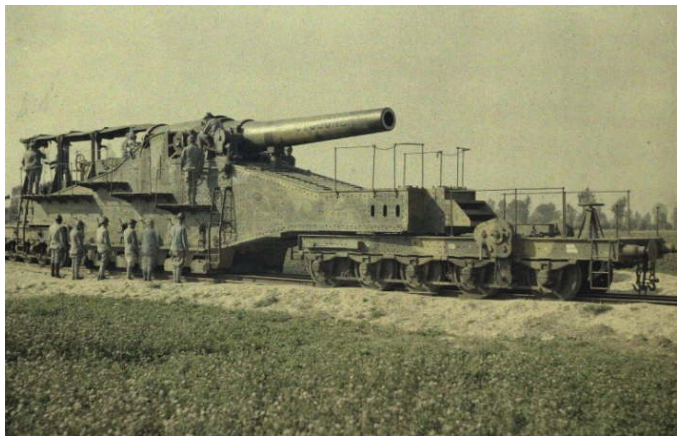


M200 Propelling Charge

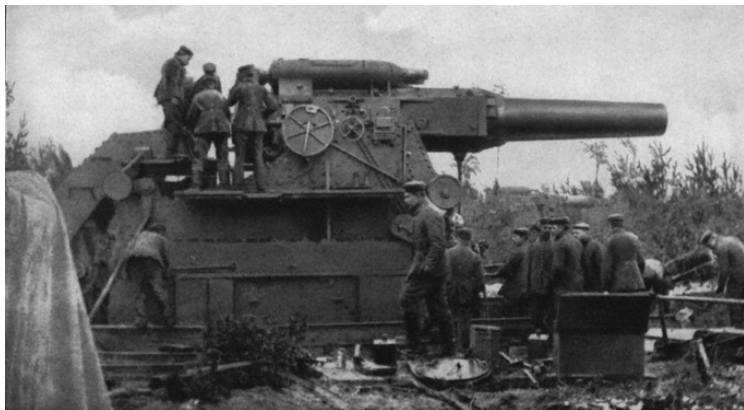
• 155mm Artillery Upgrades - Infrequent



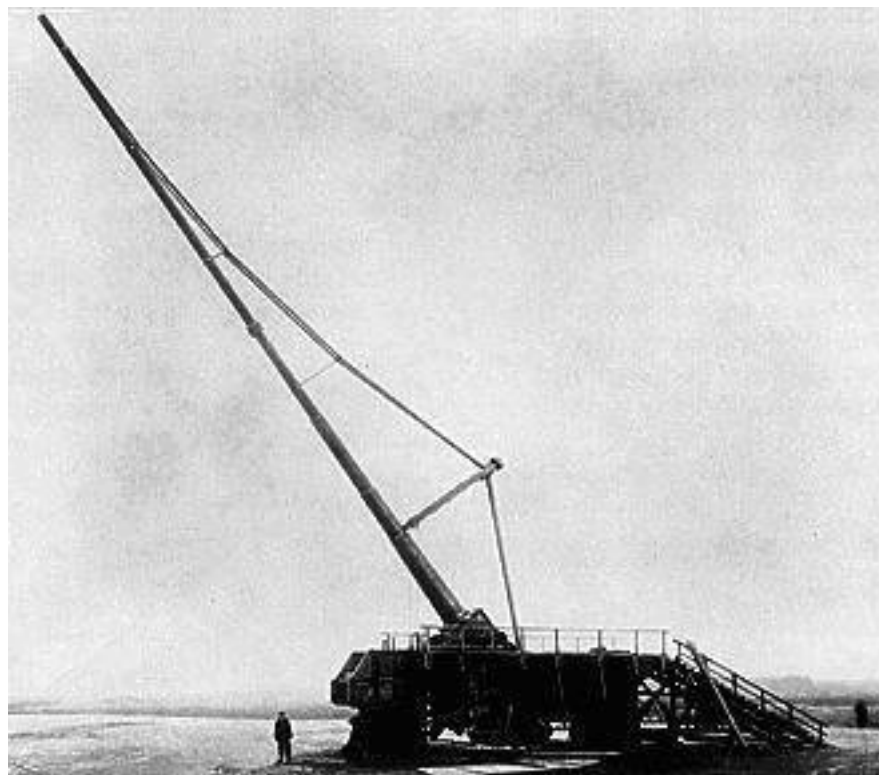
A Shift from smaller lighter mobile pieces that stayed with infantry to Larger Guns for Indirect Fire



French Cyclone



German Artillery



Paris Gun

- Predicted Fire Methods Developed
- Over 60% of Combat Casualties attributed to Artillery
- Expenditure of 1 billion rounds fired by all sides
 - Battle of Verdun 1916
 - 1,000 guns
 - 16 million rounds fired over 6 months
 - 200 million rounds produced for French 75
- French 75
 - Range : 6.9 km
 - 12 lb or 16 lb shrapnel round w/290 lead balls
- Smoke round first deployed
- Long Range Harassment Guns developed
 - Paris Gun
 - 75 mile range



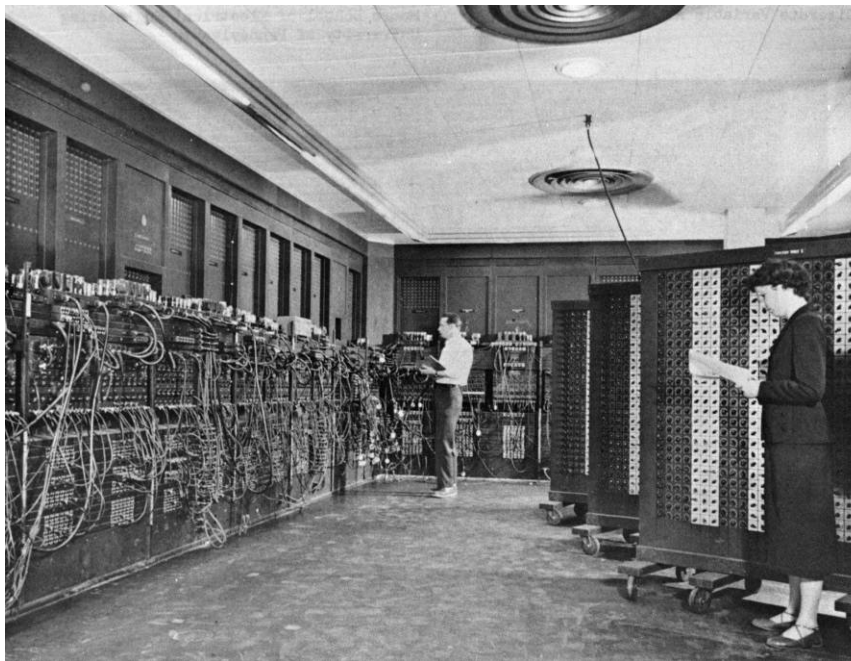
Self Propelled Guns come into widespread use

- Mark 1 Gun Carrier
- 105mm M7 “Priest”
- British Sexton
- 105mm German Wespe
- Soviet Katyusha
 - Self propelled Multiple launch rocket system
- US MLRS and 155mm Paladin

Dec 1944 US Artillery XMAS Present

- First Radar Proximity Fuze
 - Increased Effectiveness against personnel targets

- Electronic Numerical Integrator And Computer
- Computer developed for Artillery Firing Tables
- Trajectory tables to predict Projectile Flight
- 3D second order differential equations of motion performed manually



Artillery Developments

- Increased Mobility
- Longer Ranges
- Increased Firing Rates
- Increased Precision
- Increased Lethality
- Modern Battery : 6 Guns
 - 43 kg (~95 lbs) projectile @ 4 rounds per minute for 4 minutes yields.....
 - Over 1 metric ton of ordnance delivered per minute
- Desert Storm Massed Artillery Fires
 - 11 Artillery Battalions
 - Devastating Effects
 - Broke Enemy's "will to fight"

- Cannon Ball
 - Kinetic energy
 - Breach fortifications
 - Slice through Men & Horses
- Grape Shot
 - Smaller balls separating at Muzzle
- Chain Shot
 - Cannon balls joined by chain
- 1803 British General Henry Shrapnel
 - Balls blown from shell by burster charge
- Mid 1800's
 - Cylindrical-Conical projectile replaces cannon ball
 - Copper driving bands engage rifling in guns for spin stabilization and thus longer range



Grape Shot

- 1950's
 - BRL (Now ARL)
 - Scientific & Systematic approach to analysis of wound ballistics
 - Fragment Mass striking velocity
 - Random Fragmentation munitions
 - 155mm M107
 - Large fragments reduced velocity, limited area of coverage
 - Controlled fragmentation material improvements
 - High-Fragmenting Steel
 - Smaller high velocity fragments, increased total number of fragments, larger lethal area
- Typical HE
 - Overkill on immediate area of detonation lacking large area coverage
 - Sub-missiling Principle
 - Increased lethality through spreading of munitions

- ICM (Improved Conventional Munitions)
- First Generation ICM's combined sub-missiling with controlled fragmentation and ground burst
 - 105mm M413 18 Ground burst
 - 105mm M444 18 Airburst
 - 155mm M449 60 Airburst
 - 8 inch M404 104 Airburst

155mm	Cargo	% Casualty
M107	TNT	4.9
M107	Comp B	7.9
M449	60 sub-munitions	31.9

- Advanced ICM Artillery or DPICM
 - 155mm M483A1 88 dual purpose sub-missiles
 - 8 inch M509 195 dual purpose sub-missiles
 - 155mm M864 base bleed 72 dual purpose sub-missiles



M483



M509



M864

Conventional	105mm	155mm	8 inch
Rds Expended	7,079	3,465	149
Rds / kill	31.6	13.6	16.6

ICM	105mm	155mm	8 inch
Rds Expended	1,121	772	153
Rds / kill	2	1.7	0.8



Live Fire Demonstration Effectiveness Comparison



		HITS					
	Total Rounds	Three Tanks	Six APC's	Eight Trucks	Six AA's	One Jeep	Total Hits
ICM 155mm, M483	145	47	69	45	5	7	173
M107: 155mm	432	2	4	2	0	0	8

Projectile	Range (km)	CEP (m)
M795	20	119
M864	20	96
M864 (BB)	28	186
M549 (RAP)	30	267

- Delivery Error increases with Range
- Solutions to overcome delivery error
 - Smart or Precision Projectiles

First Cannon launched Precision round developed by U.S. Army

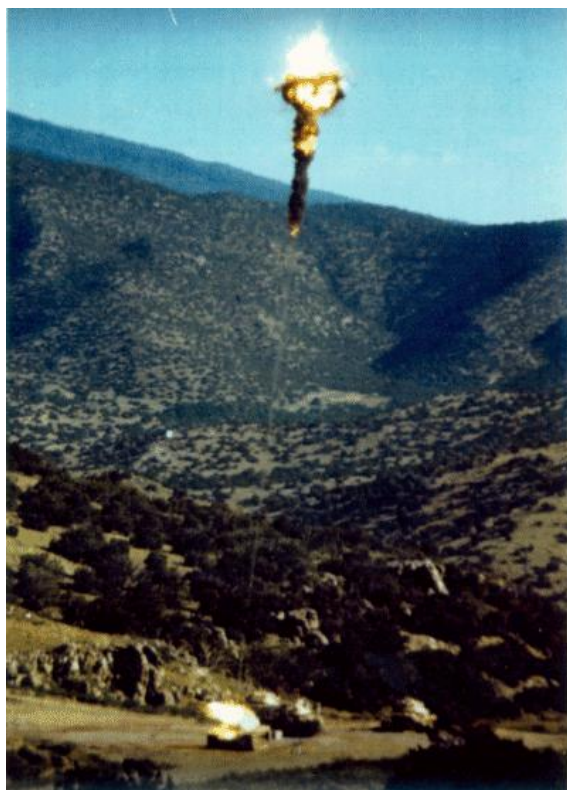


Projectile, HE, Guided, Cannon Launched, 155mm: M712 Copperhead



- 16 km Range
- Ground Laser locator designator

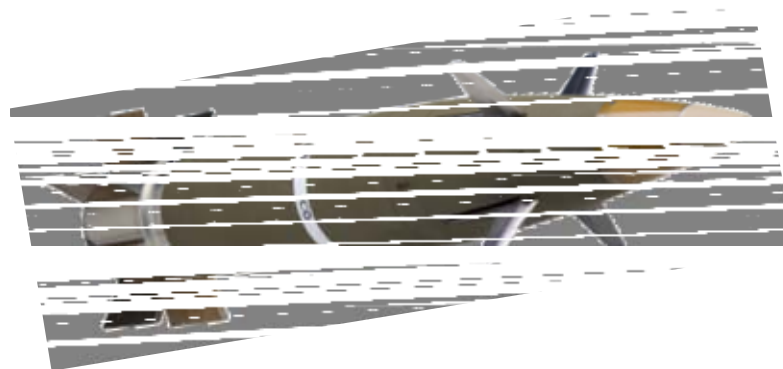
- Initially developed for 8 inch Gun
 - Shifted to 155mm in 1980's
 - **Sense And Destroy ARM**or submunition



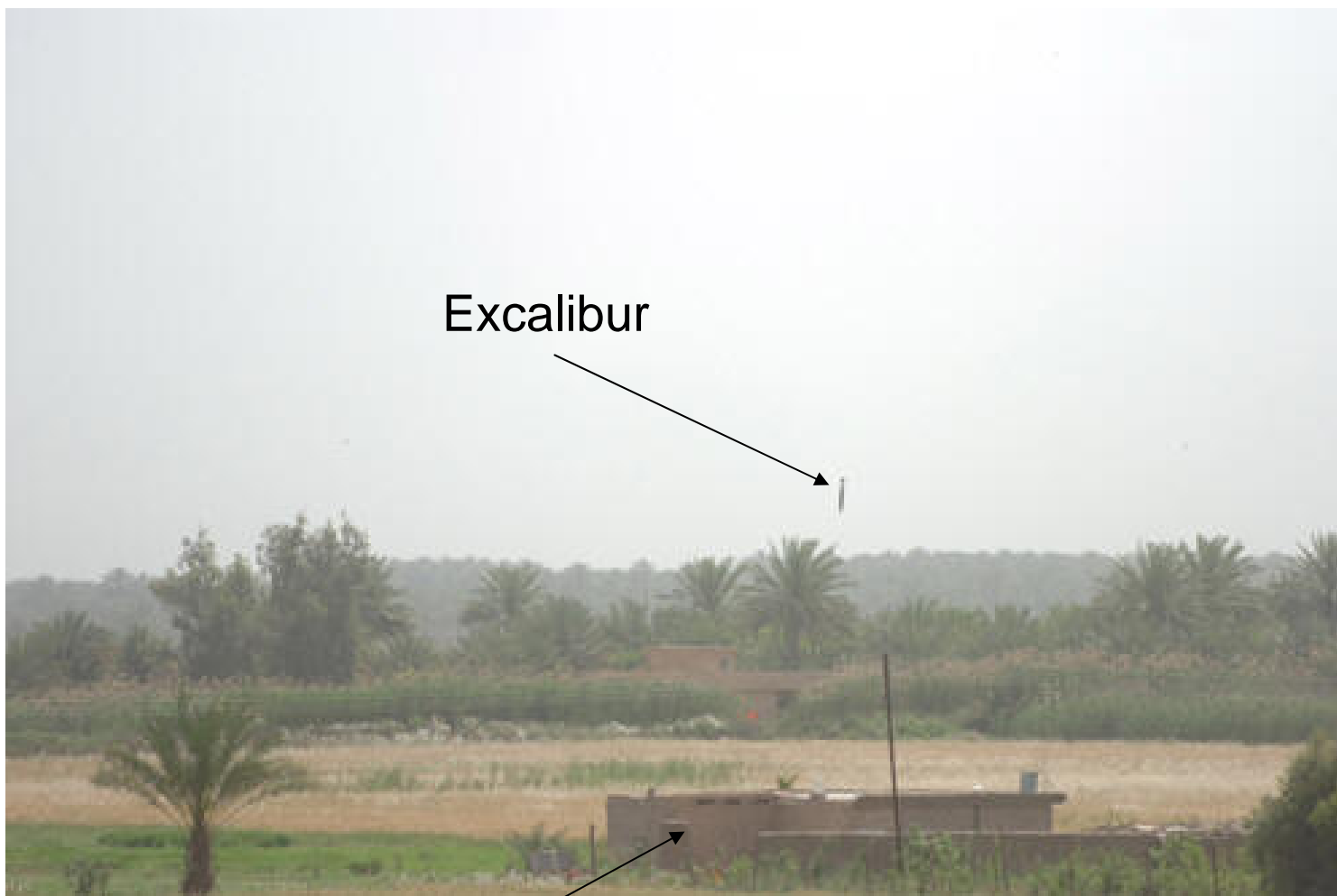
- Combat Proven 2003 Invasion of Iraq
 - 108 Rounds Fired
 - 48 vehicle kills
- Employs:
 - Infrared telescope
 - Millimeter wave Radar

- A Joint United States / Kingdom of Sweden Program
 - Fin stabilized, gliding airframe uses GPS & Inertial Navigation System Guidance
-

- **Accuracy of Less Than 10M CEP**
- **Minimizes Collateral Damage**
- **Employment Flexibility – Danger Close Fire Missions**
- **High Impact Angle**
 - Ideal For Urban Terrain
 - Optimal Effects
- **Increased Effects With Fewer Rounds**
- **Status**
 - Initial Capability Fielded in 2007



Makes Cannon Artillery Relevant in today's Urban Conflicts!



Excalibur

Target

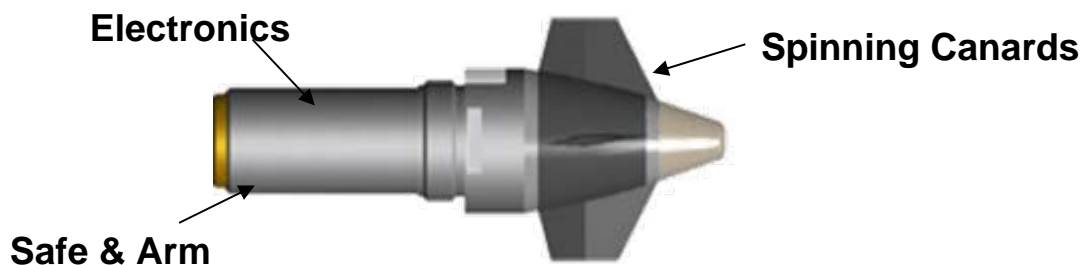
The Next Generation of Artillery

- Precision Guidance Kit (PGK)
- Infrared Illumination Round (XM1064/6)
- Very Affordable Precision Projectile (VAPP)
 - Common Smart Submunition (CSS)
- Proximity Initiated Submunition (PRAXIS)
- Extended Range Artillery (ERA XM1113)
 - Hybrid Propellant (XM350)
 - Selectable Technology for Adaptive Response (STAR)
 - Electromagnetic Gun System

- Fits in standard 155mm High Explosive artillery projectile fuze wells (deep intrusion)
- GPS guidance (incorporates SAASM)
- 20 Year Storage Life (no battery)
- Proximity & Point Detonating Fuzing



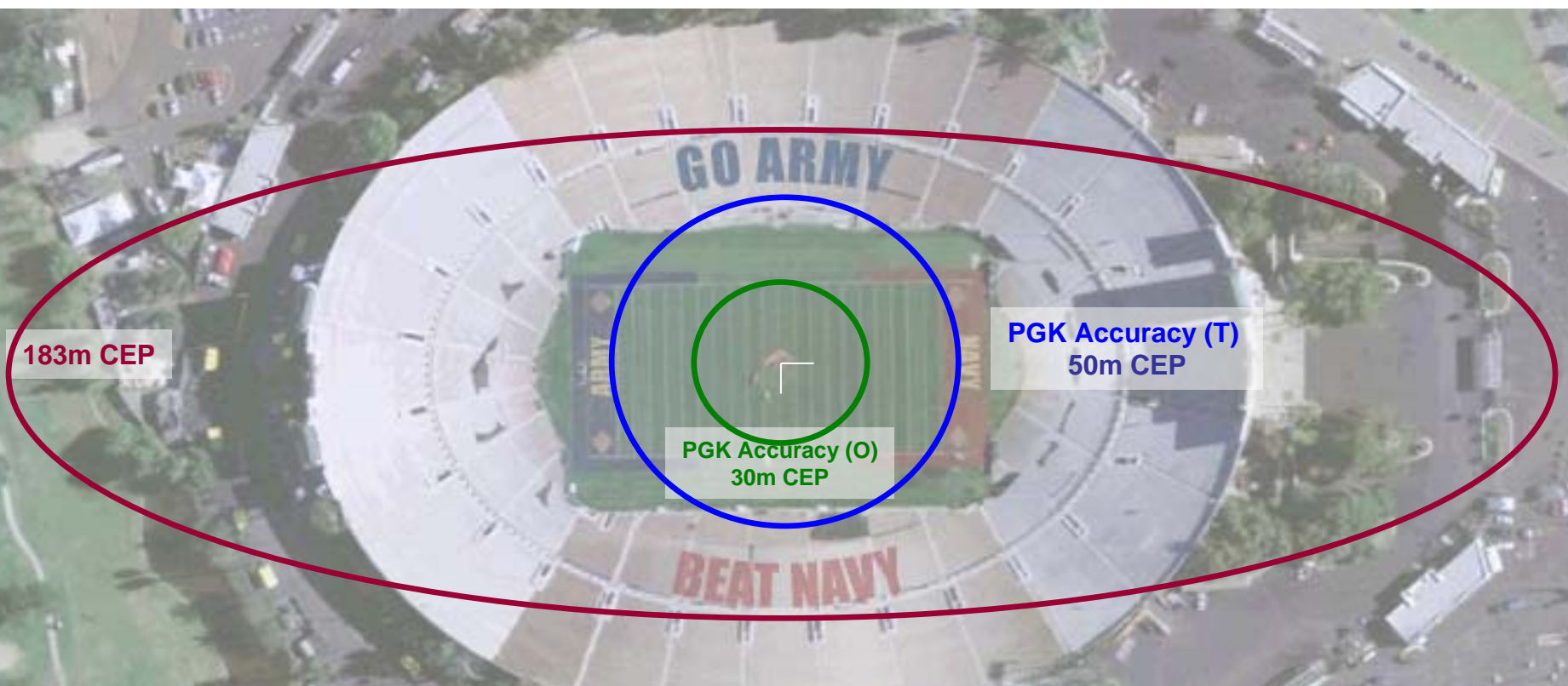
2007 Tech Demo Firing



CEP Comparison - Guided vs. Unguided

M109A6 – Paladin – 27km

155mm (HE) M549A1 with 1 mil Aiming Error at Low Angle



- IR Illumination provides the user with battlefield illumination in the infrared wavelength
- Allows user to witness movements of enemy in a dark battlefield

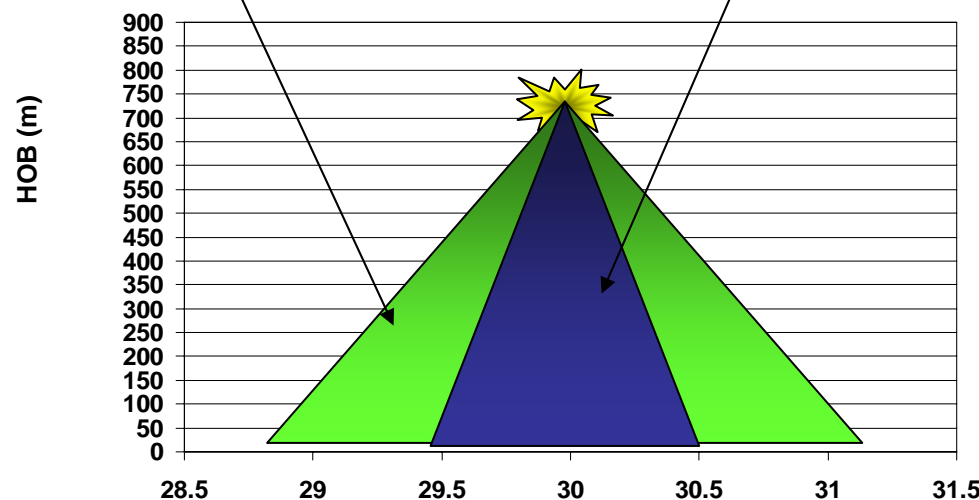
XM1066

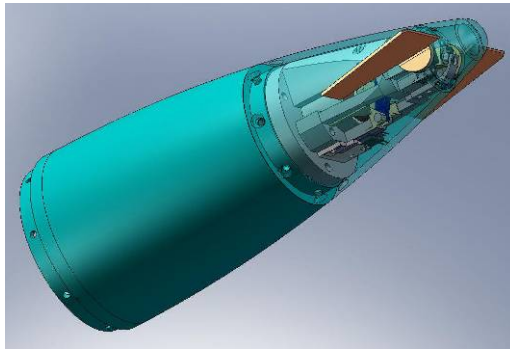
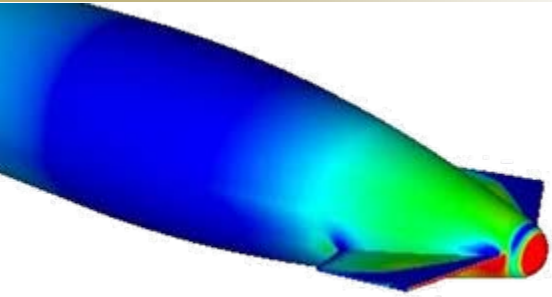


Effective IR Illum Area

Effective Visible Illum Area

155mm, IR* vs 155mm, M485A2 Candle @ 600m HOB



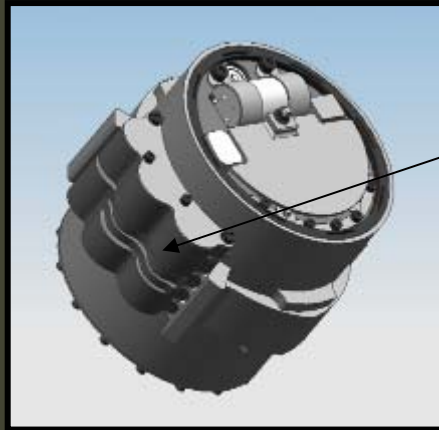


Description

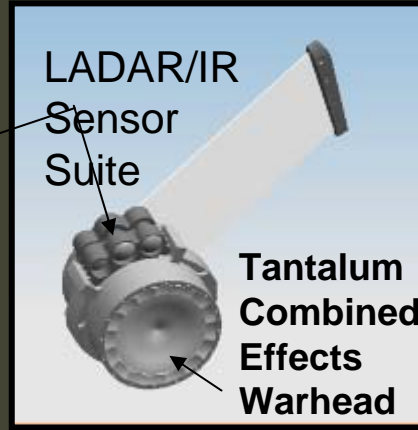
- Design and demonstration of 105mm precision artillery to focus on affordability and performance

Performance Highlights

- GPS guidance augmented by Magnetometer
- \$10,000 AUPP objective
- Range objective 24 km
- $\leq 10\text{m}$ CEP
- Greater lethality than legacy 105mm



Before deploying
Samara Wing and
sensor suite



After deploying
Samara Wing and
sensor suite

Mission Objectives

- Develop and demonstrate the next generation target discriminating submunition (school bus vs. tank)

Payoff

- Enables single round-multiple kill capability.
- Multi-platform applicability across projectiles/missiles/ mortars/UAVs.
- On board target discrimination capability.
- Reduced logistics footprint.
- Clean Battlefield

Improvements to meet ICM current requirements

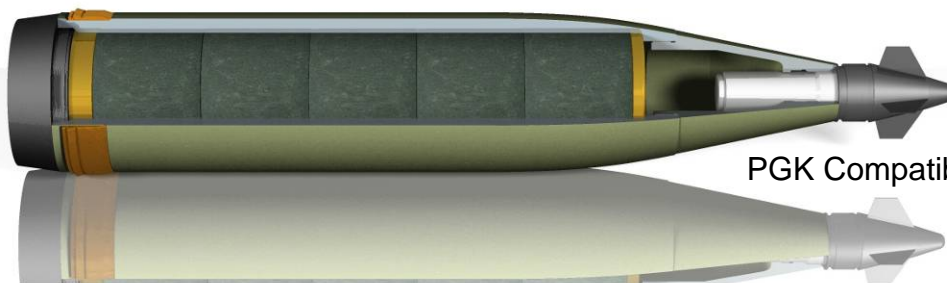
- Near Surface bursting
- Warhead optimization for Anti-personnel capability
- Weapon integration – carrier for CSS

PRoXimity Initiated Submunition

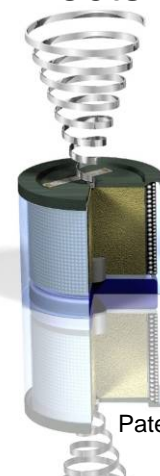


- Extreme Reliability Tri-Mode Proximity Fuze (0.99999)
 - Proximity 0.97
 - Impact 0.98
 - Time 0.98
- Goal-99 Proximity/Impact/Time reliabilities at 0.99 provides **1 in a million UXO**
- Pre-Formed Fragmentation (PFF) Dual Sized Tungsten Ball Matrix for anti-personnel and light materiel effects
- Fragmenting Steel Casing for Anti-Materiel Effects
- IM Explosive

Reutilize M483A1 Metal Parts



PGK Compatible

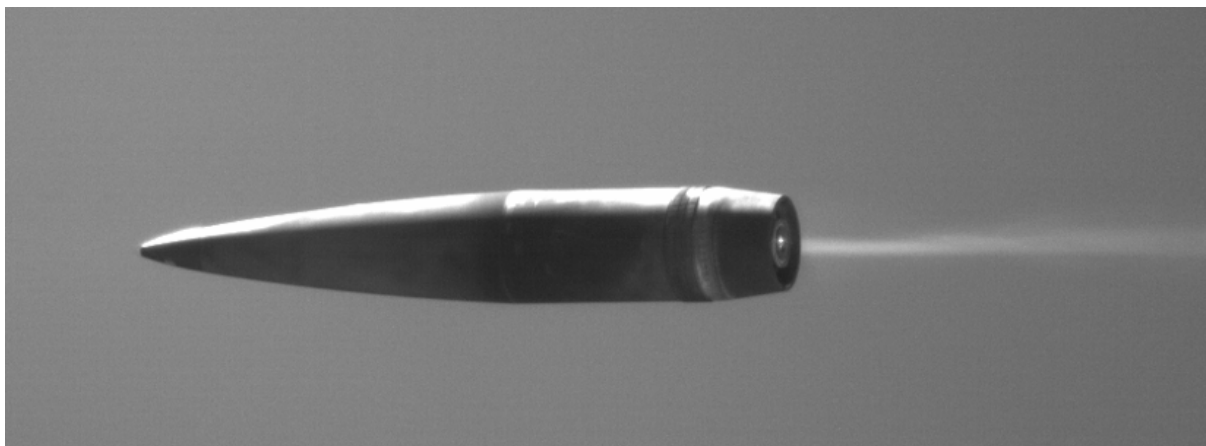


Patent Pending

5 Full Bore Submunitions

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

- Reach NLOS-C ORD requirement of 30 km (Threshold)
- Exceeds 40 km range in current 39 Cal systems
- Low cost solution based on proven technologies

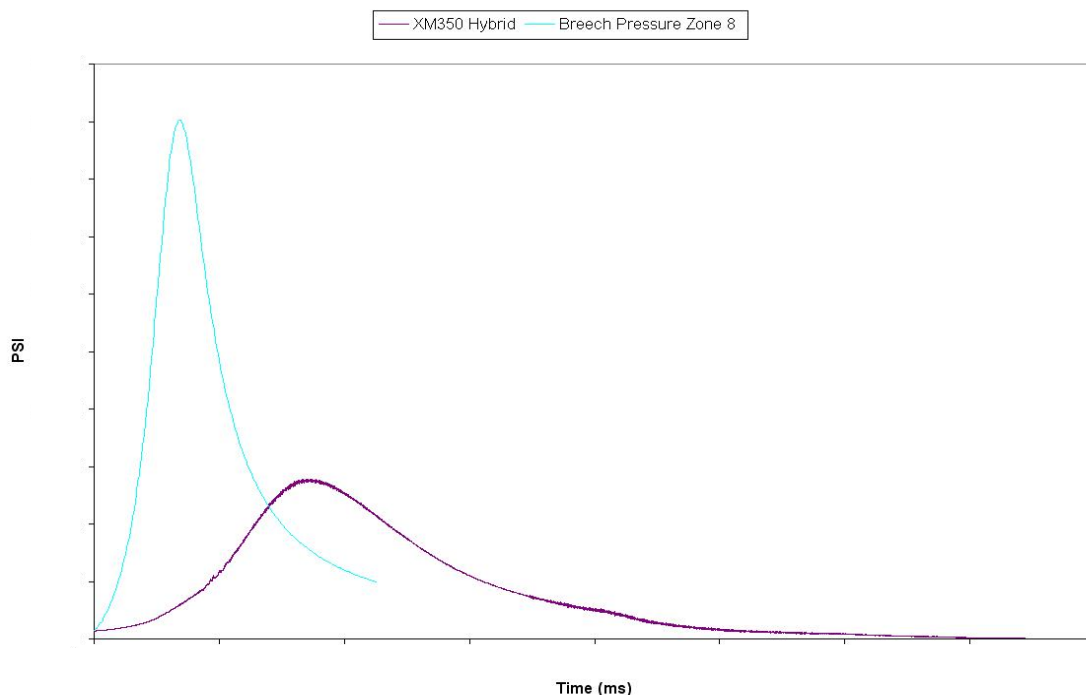


XM1113 Range Demo 2007

- Goal: To replace M67 and M200 with a single propelling charge
- Consists of 6 Semi-fixed bag increments marked 1-6
- Combined the 6 bags create 1 zoned charge



XM350 Hybrid vs. M200



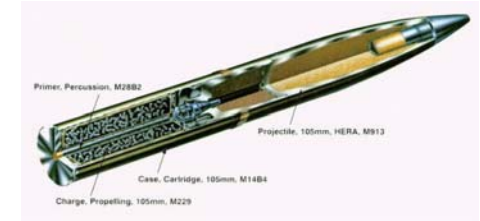
Replace current DPICM cargo



M483

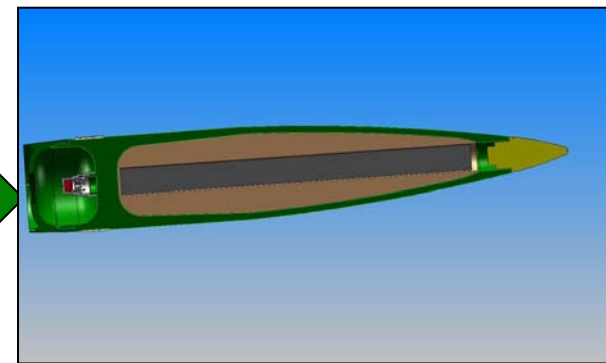
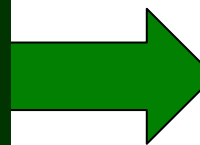


M795



M913

- Description: Develop enhanced capabilities for Artillery
 - Scaleable Output/Controlled Lethal Effects
 - Hardened for structures
 - Lower fire mission costs
 - Broader target set using adaptive response
 - Reduced collateral damage
- Warheads for:
 - 155mm: M483A1 & M795
 - 105mm: M913
- When Available: 3rd QTR FY11
- Metrics: Adaptive lethality (increase X% vs. materiel targets) and reduce collateral damage by 25% (min)



Develop and integrate new technologies

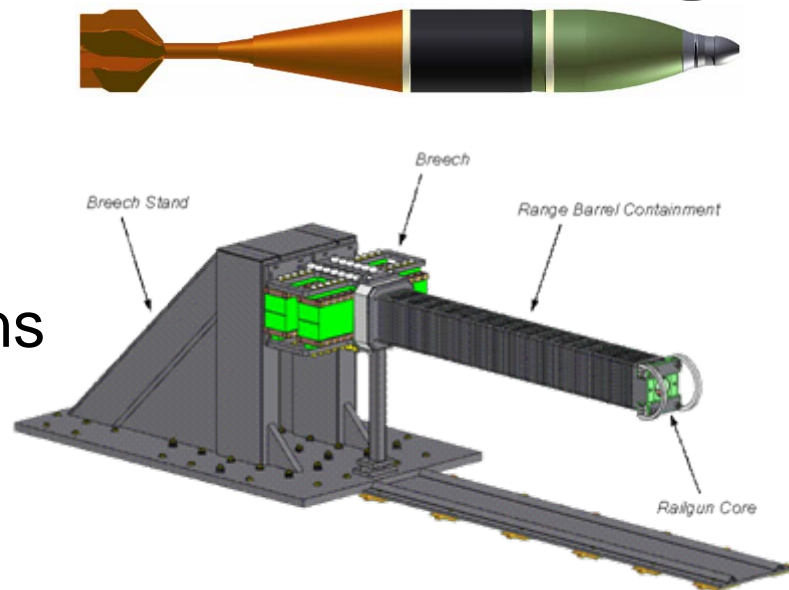
- Novel Energetics (Explosives & Propulsion)
- Combined Effects & Scaleable Effects Explosives
- Enhanced Fragmentation
- Advanced Fuzing
- Precision Guidance Kits

Objective:

- To evaluate and demonstrate ElectroMagnetic (EM) launch technology as related to the missions of an advanced mortar weapon for the Future Combat Systems (FCS).

Goals:

- Design and demonstrate EM guns (coilgun and railgun) capable of firing modified 120 mm mortar rounds at velocities up to 420 m/s.





- NLOS – Non Line of Site
- MLRS – Multiple Launch Rocket System
- HE – High Explosive
- ICM – Improved Conventional Munition
- TNT – Tri-Nitro Toluene
- DPICM – Dual Purpose Improved Conventional Munition
- CEP – Circular Error Probability
- BB – Base Bleed
- RAP – Rocket Assist Projectile
- HOB – Height of Burst
- SAASM – Selective Availability Anti-Spoofing Module
- CFD – Computational Fluid Dynamics
- UXO – Unexploded Ordnance

Dominick DeMella

Phone: (973) 724 – 4422

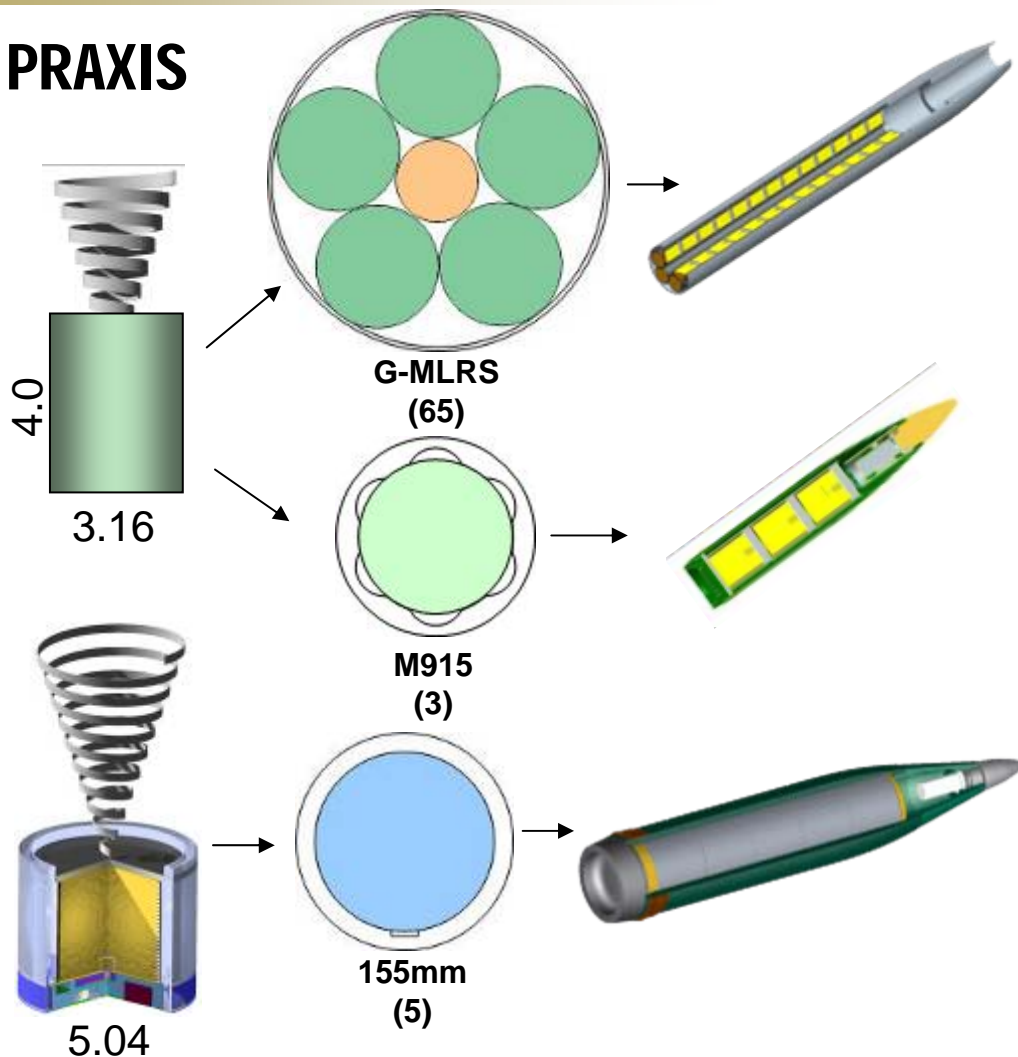
E-mail: Dominick.demella@us.army.mil



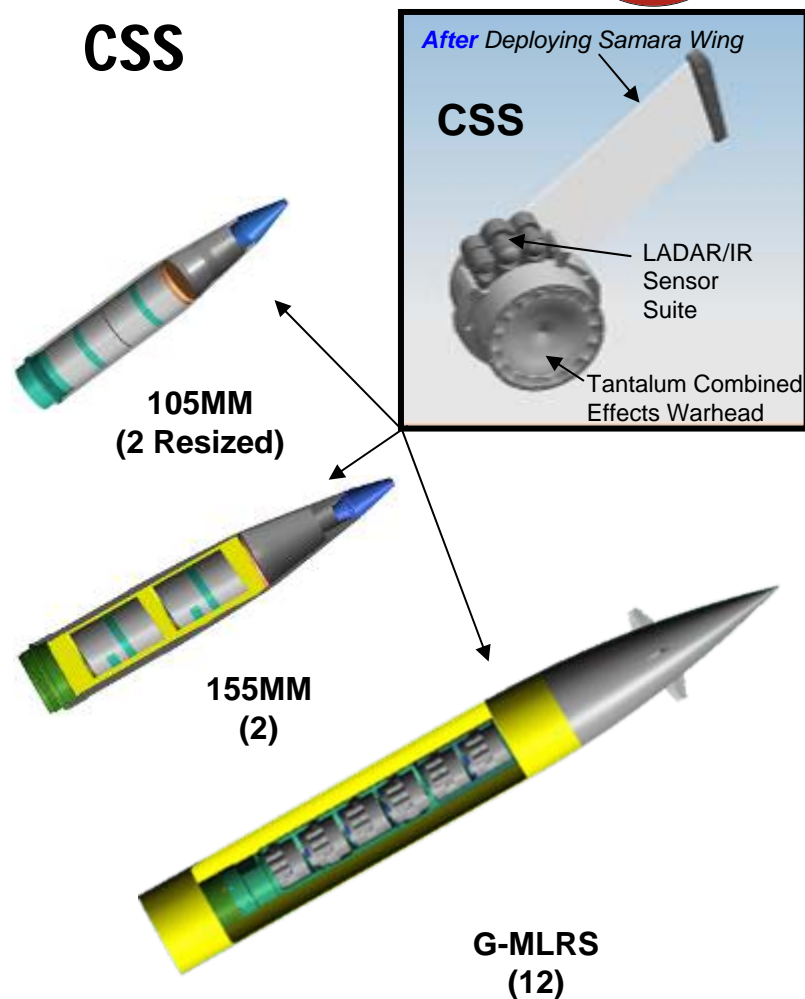
Backup



PRAXIS



CSS





Air Armament Center



*Deliver War-Winning Technology, Acquisition, Test, Sustainment...
Expeditionary Capabilities to the Warfighter*



**Precision Strike:
Enabler for Force Domination**

**Dave Eidsaune, Maj Gen, USAF
Program Executive Officer for Weapons
Commander, Air Armament Center**

U.S. AIR FORCE

10 June 2008

Integrity - Service - Excellence



Air Force Acquisition Leadership



Mr Michael Wynne
Secretary of the Air Force



Ms Sue Payton
Asst Sec for Acquisition



Maj Gen
Eidsaune
PEO Weapons



Lt Gen
Hudson
PEO
Aircraft



Lt Gen
Bowlds
PEO
Electronics



Maj Gen
Riemer
PEO F-22



Brig Gen
Davis
PEO F-35



AF Materiel Command Leadership



Gen T. Michael Moseley
Air Force Chief of Staff



Gen Carlson
AFMC/CC



Maj Gen
Eidsaune
AAC/CC



Lt Gen
Hudson
ASC/CC



Lt Gen
Bowlds
ESC/CC



Maj Gen
Close
OO-ALC/CC



Maj Gen
Reno
OC-ALC/CC



Maj Gen
Owen
WR-ALC/CC



Eglin Land Ranges

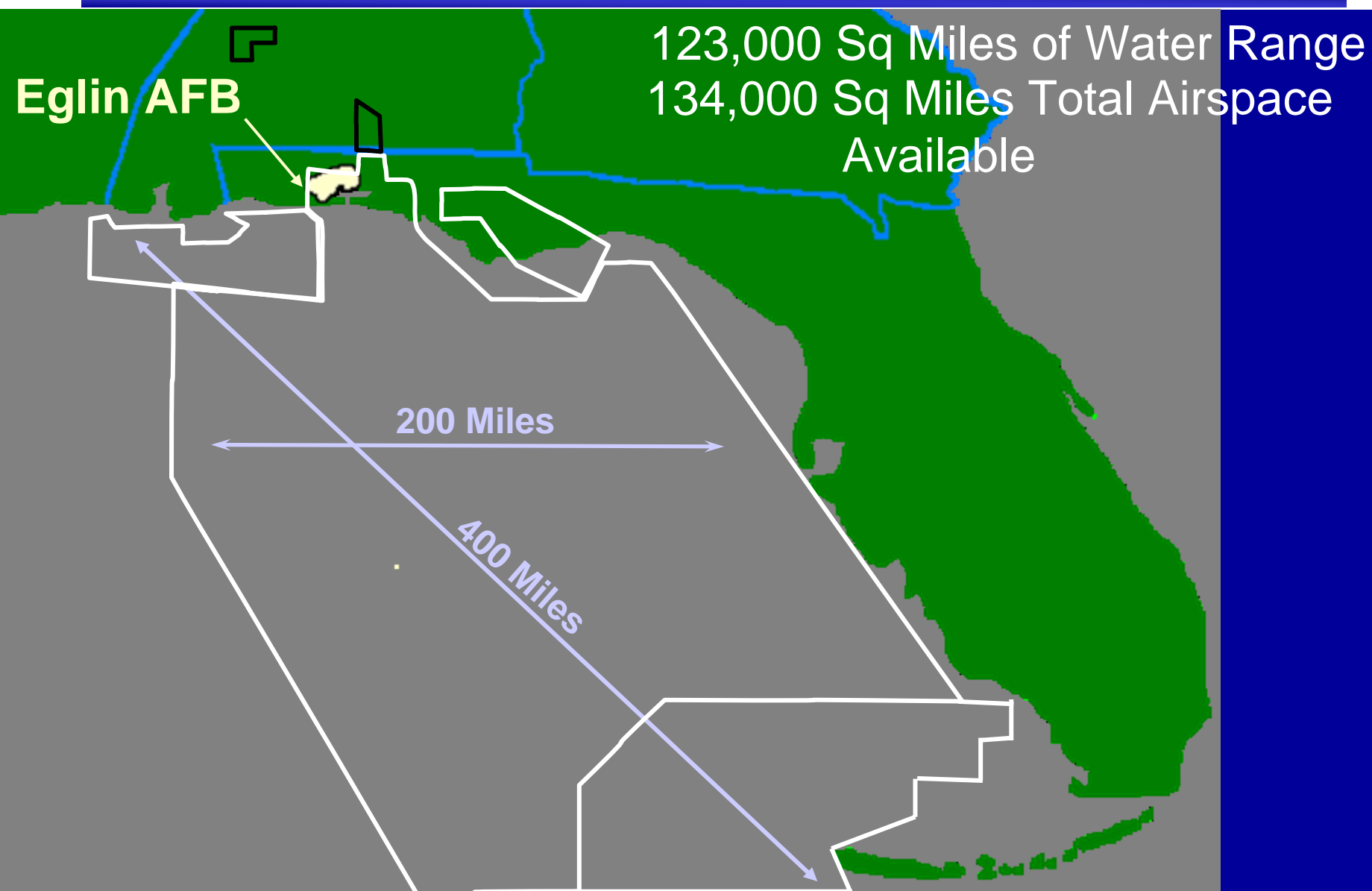


463,448 Acres
724 Square Miles





Eglin Water Ranges





Eglin Video



Eglin AFB – Full Spectrum Operations



Research



Development/Acquisition



Developmental Test



Operational Test



Combat Operations

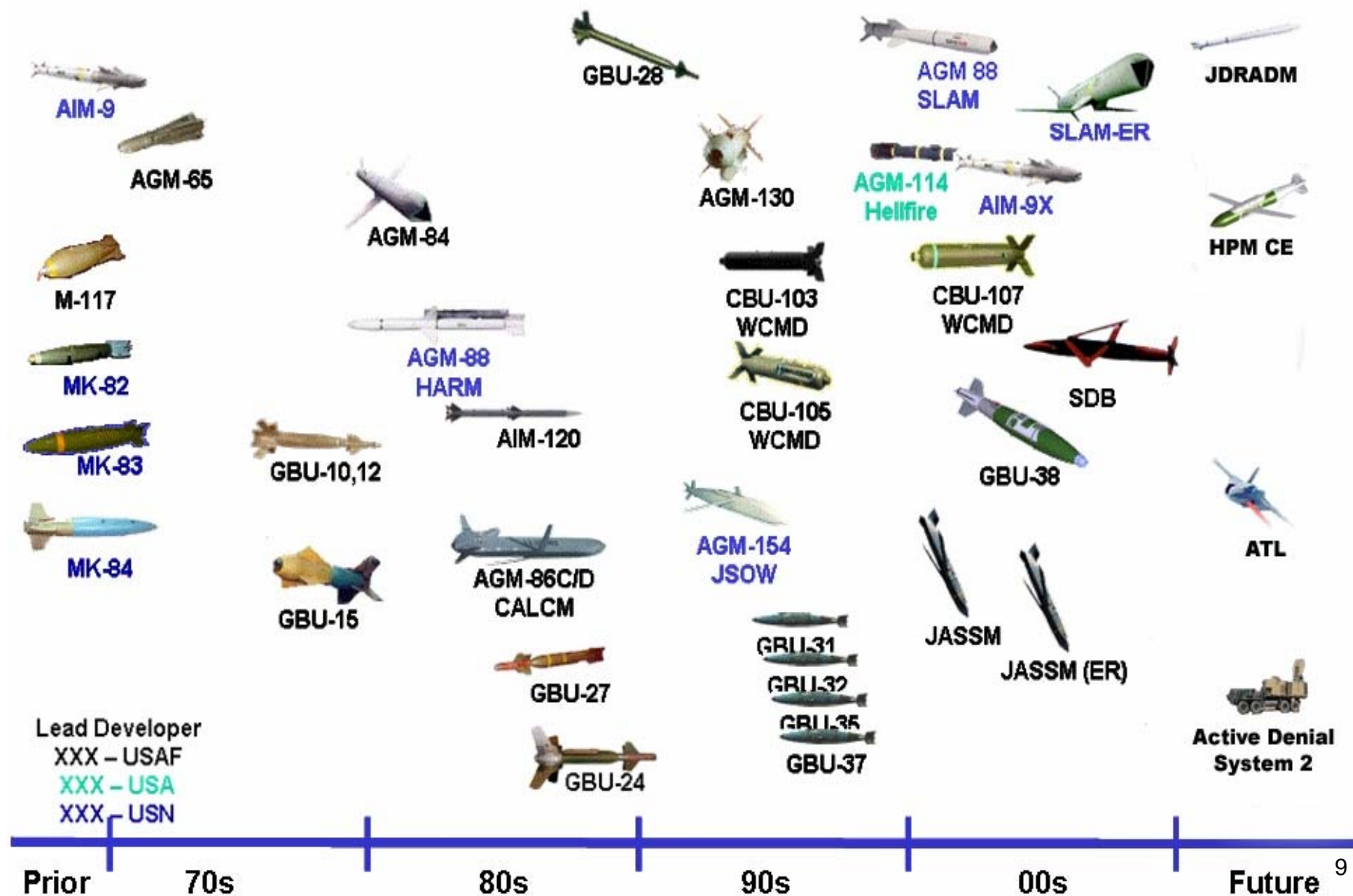
Arming the Warriors

Transition
Technology to
Weapon Systems
and Provide War
Winning
Capabilities On
Time, On Cost





Air Armament – Revolutionary Change





Weapons Portfolio Overview

Mission: Deliver war-winning technology, acquisition, test, sustainment...expeditionary capabilities to the warfighter



ADS



MAC II



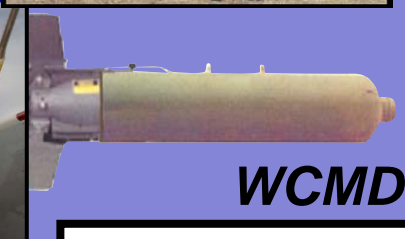
AMRAAM



HTS



P5CTS



WCMD



ATL



MALD



JASSM



JDAM



SFW



AMRAAM
Surface
Launch



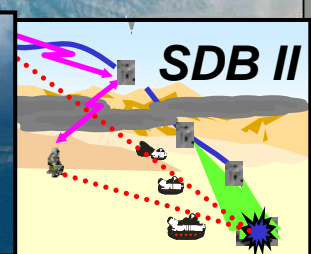
Aerial
Targets



ARTS



SDB



SDB II



AIM-9X



SEAD



LMT

Vision: War Winning Capabilities... On Time, On Cost



Advanced Medium Range Air-to-Air Missile (AMRAAM)



- Joint AF/USN program; 33 international customers
- Radar guided, launch and leave, beyond visual range, all weather missile
- Army/USMC international & surface-launched programs
- Operational on:
F-15C/D, F-15E, F-16C/D, F-22A, F/A-18A, F/A-18C/D, F/A-18E/F
- Entered inventory in 1989
- Over 14,000 delivered
- Combat proven in Bosnia, & Kosovo, and Iraq (9 kills)





Joint Dual Role Air Dominance Missile (JDRADM)



- Single missile for USAF/USN Air-to-Air and Air-to-Ground missions – potential follow-on to AMRAAM and HARM
- Defeat evolving air and ground threats
- Increased standoff, load-out flexibility
- Enhanced lethality, propulsion, agility
- Integrate on F-22, F-35, legacy aircraft
- Notional Schedule:
 - Risk Reduction – FY08-09
 - Concept Refinement – FY10-11
 - Tech Development – FY12-13

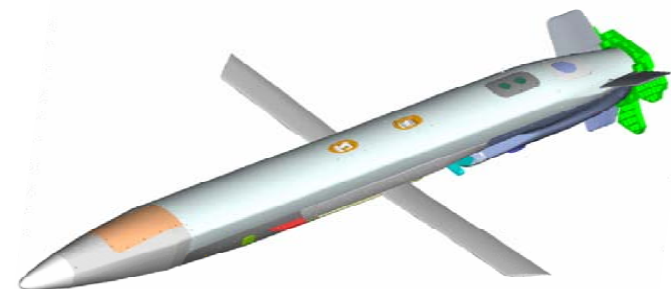




Miniature Air Launched Decoy (MALD) MALD Jammer (MALD-J)



- Low-cost, Air-launched, Expendable Decoy - Can Represent Fighter/Attack/Bomber
- Increase Enemy's "Fog Of War"-Global Strike CONOPS Enabler
 - Profiled in the Airborne Electronic Attack (AEA) Systems of Systems Approach
 - Degrades Awareness, Highlights Location, and Depletes IADS Resources
 - Increases Survivability of "Kick Down the Door" Force
- Threshold aircraft F-16 & B-52
- Currently in DT with RAA projected for FY 09
- MALD-J Will Add a Stand-in Jamming Capability

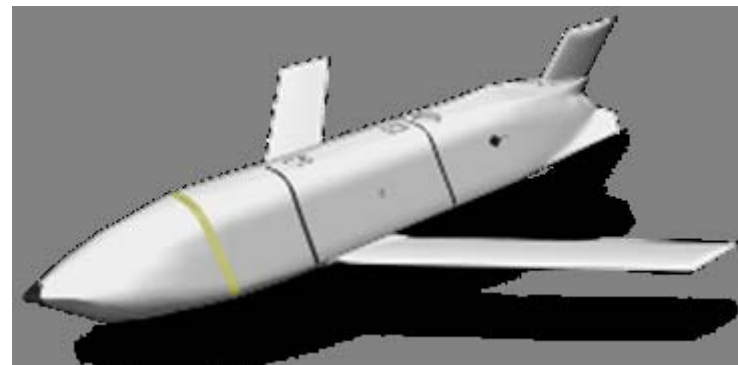




Joint Air-to-Surface Standoff Missile (JASSM)



- Autonomous precision strike cruise missile
- Fixed and re-locatable targets
- Insensitive munition compliant 1000 -lb class warhead
- Guidance: Inertial Navigation / GPS
- Operational on:
F-16C/D, B-1B, B-2A, B-52H
- Entered inventory in 2003
- Over 600 delivered
- Nunn-McCurdy Certification – May 08





JASSM 16 Shots





Sensor Fuzed Weapon (SFW)



- Anti-armor wide area coverage weapon
- Moving and stationary enemy armor (main battle tanks and support vehicles)
- Multiple kills per pass
- Operational on:
F-16C/D, F-15E, A-10, B-52, B-1B, B-2
- Entered inventory in 1996
- Over 4,000 delivered
- Combat Proven in OIF
- Production ongoing



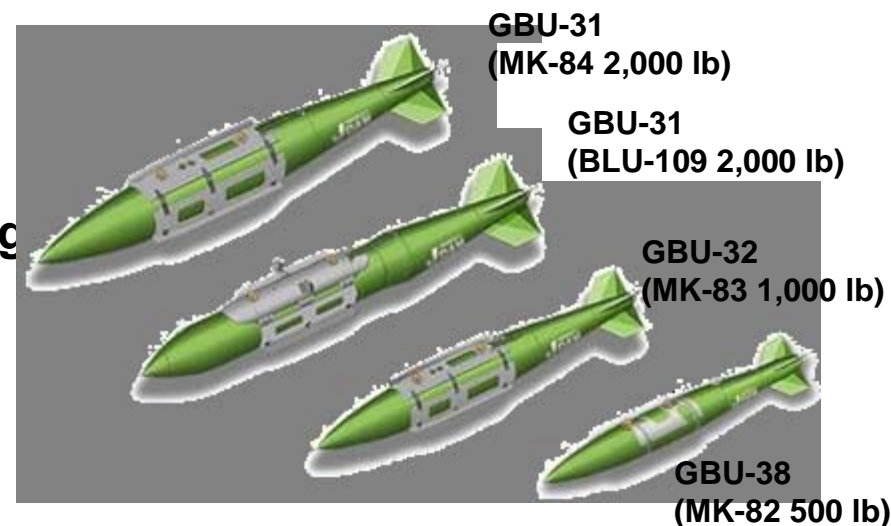
BLU-108
Submunition

***Projectile
(40 per)***



Joint Direct Attack Munition (JDAM)

- Global Positioning System (GPS) aided Inertial Navigation System (INS) tail kit
- Mk 80 series / BLU-109 warhead compatibility
- Accurate <5 meters, in-flight retargeting
- Autonomous and adverse weather
- Operational on:
 - F-15E, F-16C/D, F/A-18C/D, F/A-18E/F, F-22A,
 - F-117, AV-8B, B-1B, B-2A, and B-52H
- Entered inventory in 1998
- Over 179,000 delivered
- Over 19,000 used in combat (OAF, OEF, & OIF)



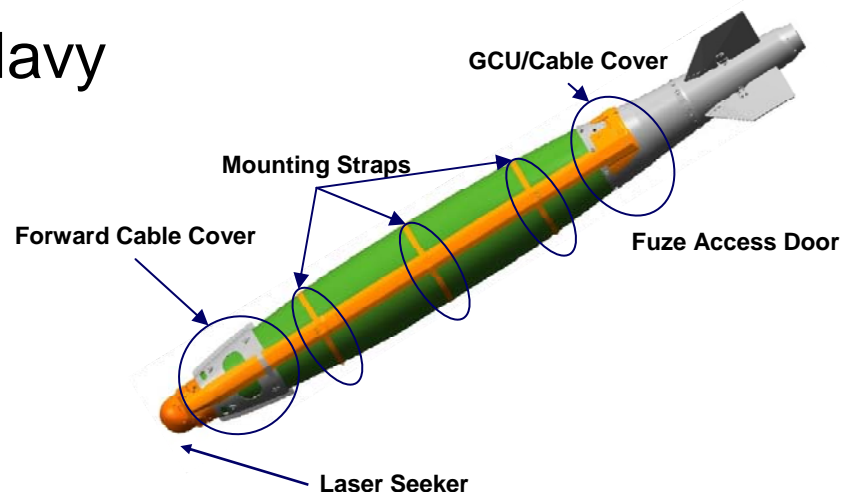
Warfighter's Air-to-Ground Weapon of Choice



Laser JDAM



- Response to Urgent Operational Need
- Adds Field-Installable Precision Laser Guidance Kit to GBU-38 JDAM
- Extends JDAM Capability to include Moving Targets up to 70 mph
- Production: 400 Air Force, 200 Navy
- Accuracy: 6m at 70 mph
- Mk-82, BLU-111, BLU-126 Compatibility
- F-15E, F-16, F/A-18
- Initial Kits Are in the AOR





Small Diameter Bomb (SDB)

- All-weather, autonomous, precision strike, 250 lb class GPS/INS weapon
- Reduced collateral damage
- Flexible attacks with standoff ranges
 - SDB derives its own non-ballistic flight path (0.4M glide) based on release range, altitude, speed, climb, and winds
- Increased loadout--multiple strikes per sortie
- Cockpit-selectable electronic fuze
- Operational on F-15E, 700 delivered
 - F-15E radar or Sniper pod can self generate accurate coords or receive data-linked transfer of coords and imagery
- Combat proven in OEF/OIF



BRU-01



SDB Flight Characteristics







Small Diameter Bomb

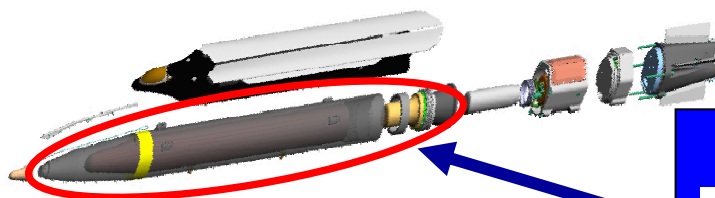




Small Diameter Bomb Focused Lethality Munition (SDB FLM)



- FY06 Out-of-Cycle JCTD
- CENTAF urgent need
- Low collateral damage variant of SDB
- Precisely delivers lethal, short range blast
- Completed JCTD testing – Dec 07
- 50 residual assets delivered to AOR – Mar 08



SDB I Hardware Attaches
to FLM Composite Case

New Technology

- Composite Case Warhead
- Multi-Phase Blast Explosive
- Blast Only



Small Diameter Bomb II (SDB II)

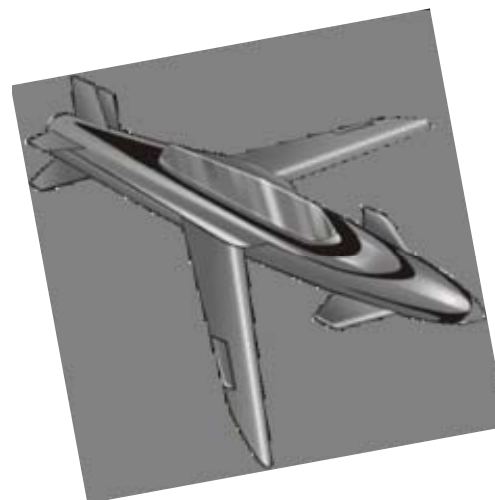


System Description

- **Capable against moving targets**
- **Compact, all weather, standoff weapon**
- **INS/GPS guided, precision weapon**
- **Tri-mode seeker (IR, radar, laser)**

Acquisition Activities

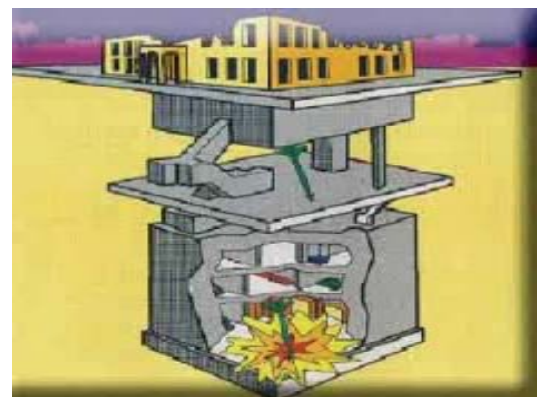
- Currently in risk reduction
- Two competing contractors
- Milestone B - FY10





Hard Target Void Sensing Fuze

- System to be employed against new and emerging hard and deeply buried targets
- Detects multiple voids
- Survives and operates after penetrating 5K-15K PSI concrete target
- Programmable from cockpit
- Competitive Prototype JCTD FY08-10





Universal Armament Interface (UAI)



Program Objective: Decouple weapon integration schedules from aircraft OFP update cycle



Future Weapon Capability Themes

- Low Collateral Damage
- Moving Targets
- Non-Lethal/Non-Destructive
- Hard/Deeply Buried Targets
- Flexibility
 - Targeting on the Net
 - “Dial-a-Yield”
- Supersonic/Hypersonic
- Extended Ranges
- Perpetual/Persistent
- Directed Energy



Small, Low Collateral Damage, Flexible Yield Weapons



Directed Energy Opportunities





Advanced Tactical Laser (ATL)



- Ultra-precise target engagement
- 100KW-class high-energy laser
- Integrated in C-130 airframe
- Speed of light weapon
- Deep magazine
- Scalable effects
- Reduced collateral damage
- ACTD ends 4TH qtr FY08
- Extended User Evaluation continues thru FY10
- Developing CONOPS for solid state laser





Active Denial System (ADS)



- Warfighter Urgent Need
- Counter-personnel, non-lethal DE weapon
 - Deters advancing adversary--perimeter protection
- Induces intolerable sense of heat
- Uses antenna to direct focused, invisible beam
 - Heat sensation ends when beam removed—no permanent injury
- Gov't acceptance – Jun 08
- Possible deployment in Jul 08
- Planning for program of record in FY10



System 1



System 2



System 0





High Power Microwave - Counter Electronics



- Overview
 - Packaged in inventory munitions mold line
 - Weapon services multiple targets
 - Established effectiveness in realistic scenarios
 - Selective target engagement
- Strategy
 - Industry Technology Assessment, FY08
 - JCTD submission, FY09
 - FY10 POM Submission





Industry's Role – How Can You Help?



- Robust Systems Engineering
- Vendor and Supplier Management
- Reliable, Quality Products
- Cost and Schedule Realism

Thank You For Your Efforts and Dedication to Excellence



*To the Air Armament
Center Commander,*



War-winning Capabilities ...

... On Time, On Cost





BACK-UPS



Accomplishments

MALD/MALD-J

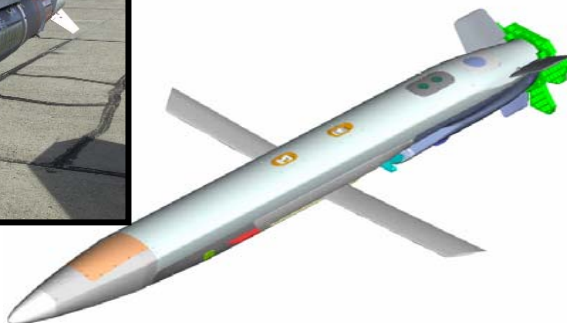
- MALD completed DT - Feb 08
- MALD production award - June 08
- MALD-J risk reduction contract award - Mar 08

Laser JDAM – JUON

- OUE completed/Fielding authorized
- First units delivered to AOR - Apr 08
(2 months early)

JASSM

- Successful reliability tests - Feb 08
- Nunn-McCurdy Certification - May 08



SDB FLM – UON

- Completed JCTD testing – Dec 07
- 50 residuals to AOR - Mar 08
(2 months early)

FUZES

- HTVSF JCTD: 2 competitive contracts
- Second JPF production line now operational

AMRAAM

- AIM-120C-7 fielding – Dec 07

P5 Combat Training System

- Declared operational at 5 USAF & 1 Navy Site



Universal Armament Interface (UAI)



- UAI Implementation on Aircraft and Weapons is Underway
- Initiative to Provide Standardized Software Interfaces in Platforms, Weapons, and Mission Planning
- Decouple Weapon Integration Schedules from Aircraft Platform Block Upgrade Cycle
- Industry Consortium Developed New Interface Standard
 - Baselined Dec 05; Rev 01 May 06; Rev 02 in work
 - Managed at Aeronautical Systems Center:
 - Ms Nadine Thomas, (937) 255- 7089 or DSN 785-7089
 - F-15E, JASSM, & JDAM UAI – Ready for the Unexpected in FY09

**First Fielded Capability Without Aircraft OFP Change:
SDB II on F-15E in FY14**



Network Enabled Weapons

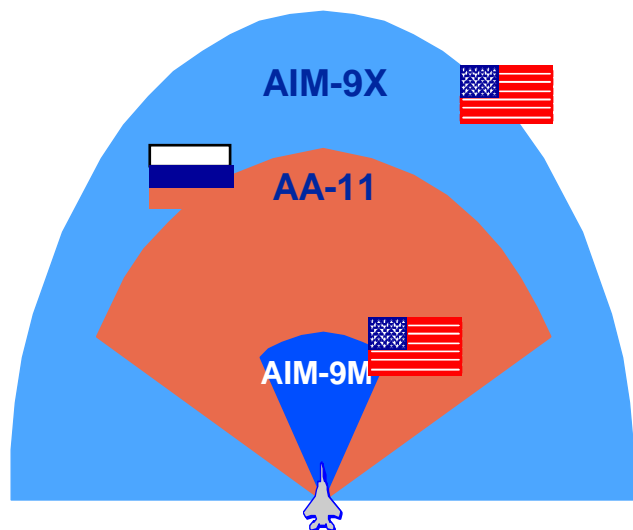
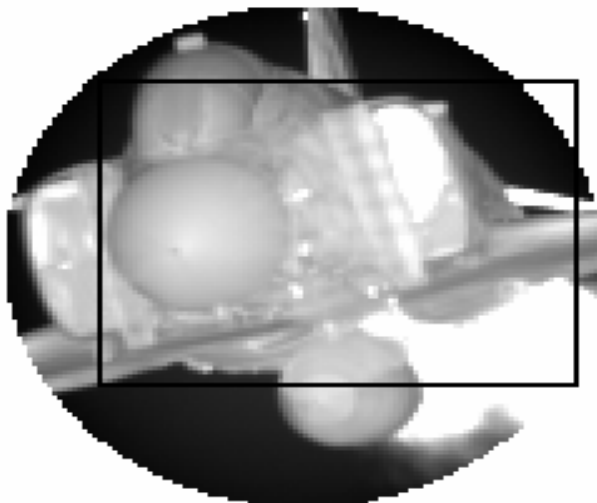


- Government and Industry Team developed Interface/Message Standard
 - Expect CY08 start for Link-16 NATO coordination
 - Already released to Australia and United Kingdom
- Aggressively tackling operational challenges
 - Common key handling procedures for munitions
 - Common Joint Mission Planning Components
 - Network Designs
 - Changes to ATO, MTO, OPTASK LINK
- CONOPS and CONEMP JROC items of interest

First Fieldings Expected ~ 2010: JSOW, HARPOON

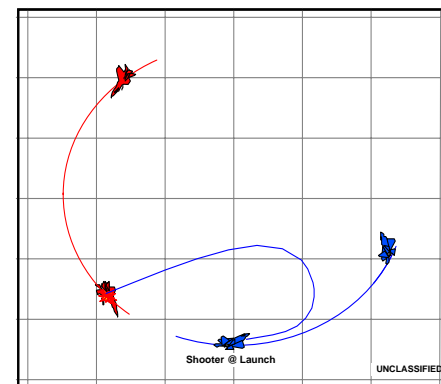


AIM-9X



- Counter Superior Fielded Threat (16 Years)
- Extremely Maneuverable, High Off-Boresight
- Beyond and Within-Visual-Range Combat

- Increased Pk
- Interoperable
- Full Day/Night Capability
- Enhanced IRCCM Capability
- High Off-Boresight Acquisition and Launch
- Improved Acquisition in Blue Sky / Clutter
- Improved Maximum and Minimum Range
- Operational deliveries to date
 - 816 to USAF, 560 to USN
- Operational on F-15C/D, F-16C/D, F/A-18





SDB Takeaways



- Evolutionary leap in combat capability
 - Precision, increased standoff, and reduced collateral damage
- Challenges to overcome
 - Long and unpredictable TOF
 - Deconfliction considerations
 - Battle damage assessment



IOC Declared – 3 Oct 06

1st Combat Drop – 11 Nov 06



Small Diameter Bomb (SDB I)



- 250-lb class GPS/INS weapon providing very accurate CEP
- All-WX, autonomous, reduced collateral damage
- Flexible attacks with significant standoff range
- SDB derives its own non-ballistic flight path (0.4M glide)
 - Depends on release range, altitude, speed, climb, and winds

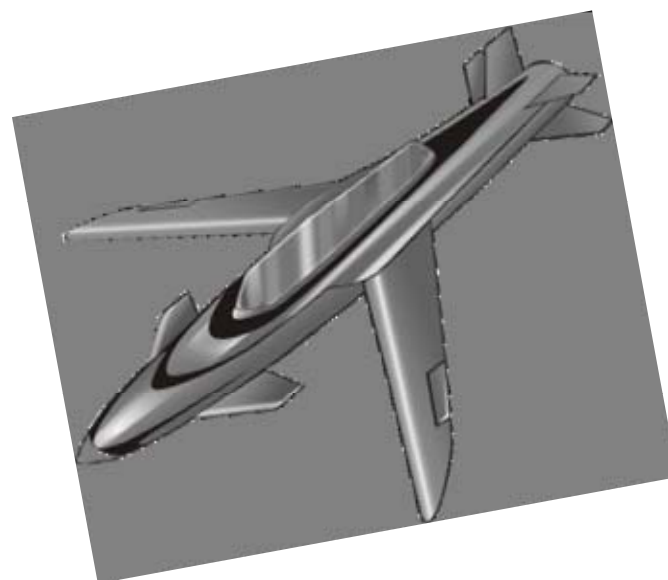




Small Diameter Bomb II (SDB II)

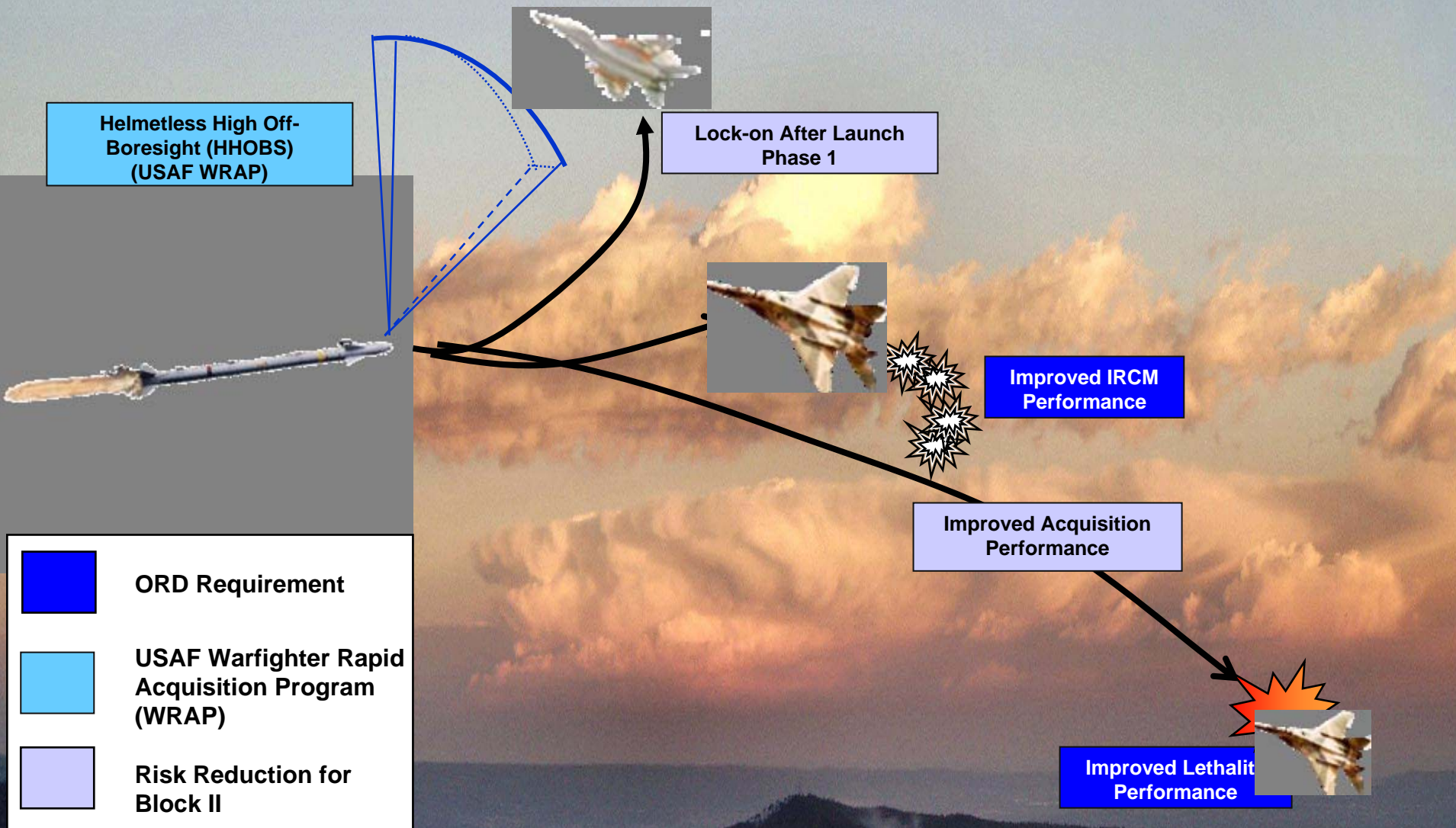


- System Description
 - Capable against moving targets
 - Compact, all weather, standoff weapon
 - INS/GPS guided, precision weapon
 - Tri-mode seeker (IR, radar, laser)
- Acquisition Activities
 - Currently in risk reduction
 - Two competing contractors
 - Milestone B - FY10





AIM-9X OFS v8.209 ...In OT NOW





C4I and C2 Systems Testing

Internetting the Warfighter

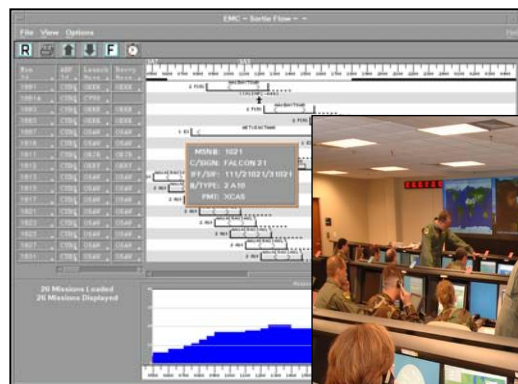


Distributed Common Ground System



Global Broadcast System

- Air Operations Center (AOC)
- Theater Battle Management Core System (TBMCS)
- Time Critical Targeting
- Control/Reporting Center (CRC) Upgrades
- Regional/Sector AOC (R/SAOC)



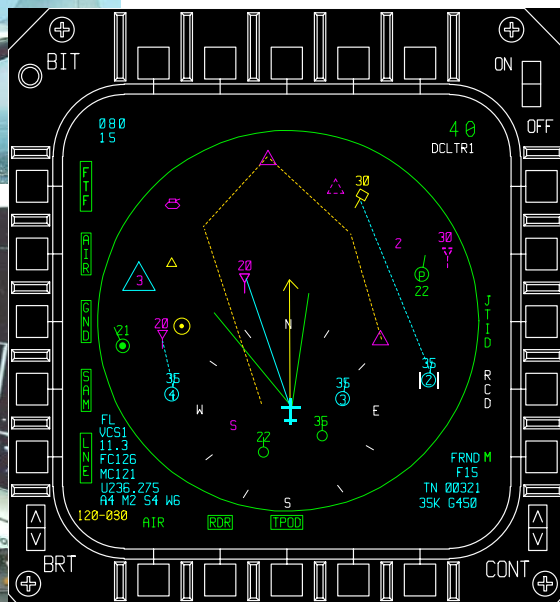
- Deliberate/Crisis Action Planning Execution Segment (DCAPES)
- Integrated Broadcast Service (IBS)
- Global Combat Support System – Air Force (GCSS-AF)



Tactical Comm and Datalinks

Test Center of Expertise

- JTIDS
- FDL
- JTRS
- B1 IDL





Wind Corrected Munitions Dispenser (WCMD)



- Tail kit for guiding dispenser weapons
- INS corrects for winds, launch transients and ballistic errors
- Accuracy: 100' req'd; ~50' demo'd
- Fielded on B-1, B-52, F-15, F-16
- Future fielding on A-10, F-35
- Combat proven: 1,650 used in OEF/OIF
- Full Rate Production completed Oct 06
 - 27,596 tail kits built
 - AUPP (BY94): \$25K req, \$13.5K actual
- WCMD-Extended Range SDD cancelled on 9 Aug 06





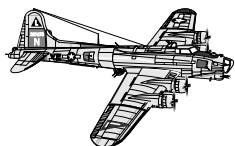
“The Heart and Soul of the Air Force is Range and Payload”

*Gen T. Michael Moseley
Chief of Staff*



Evolution of Precision

1943



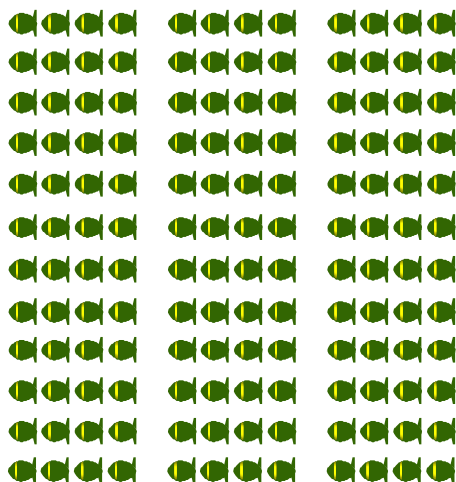
WWII

1500 B-17 sorties

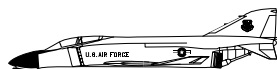
9000 bombs (250#)

3300 ft CEP

One 60' x 100' target



1970



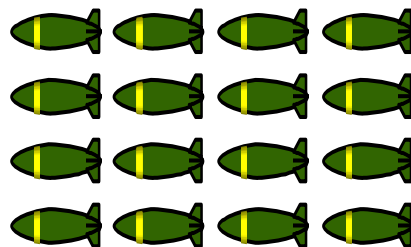
Vietnam

30 F-4 sorties

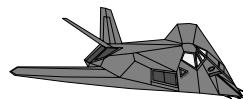
176 bombs (500#)

400 ft CEP

One target



1991



Desert Storm

1 F-117 sortie

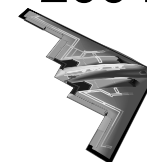
2 bombs (2000#)

10 ft CEP

2 targets per sortie



2004



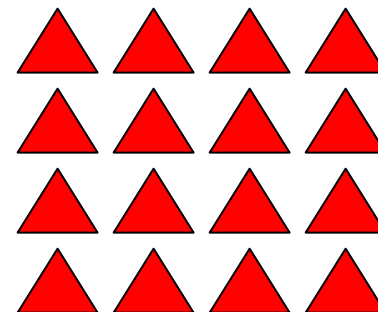
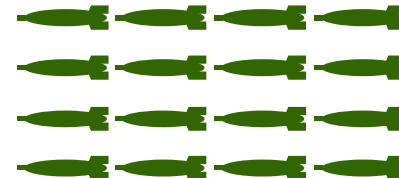
OAF/OEF/OIF

1 B-2 sortie

16 bombs (2000#)

7 ft CEP

16 Targets per Pass





Air Dominance

AMRAAM



AIM 9X



HTS



MALD / MALD-J





Long Range & Area Attack

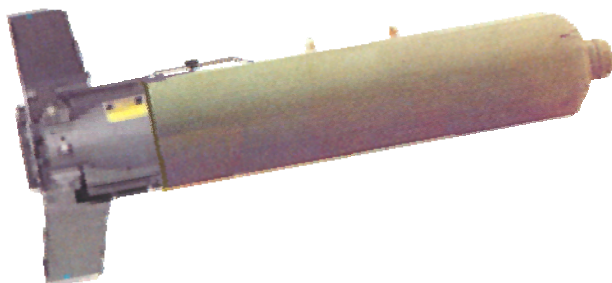
JASSM



SFW



WCMD



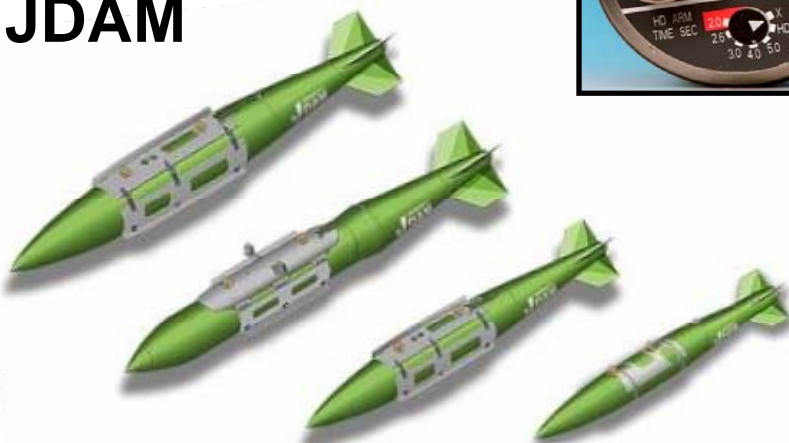


Direct Attack & Miniature Munitions

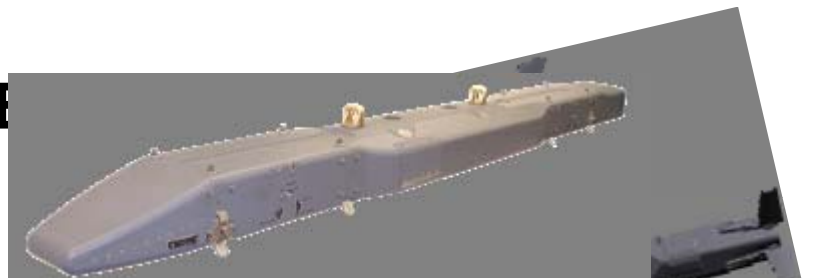
JPF



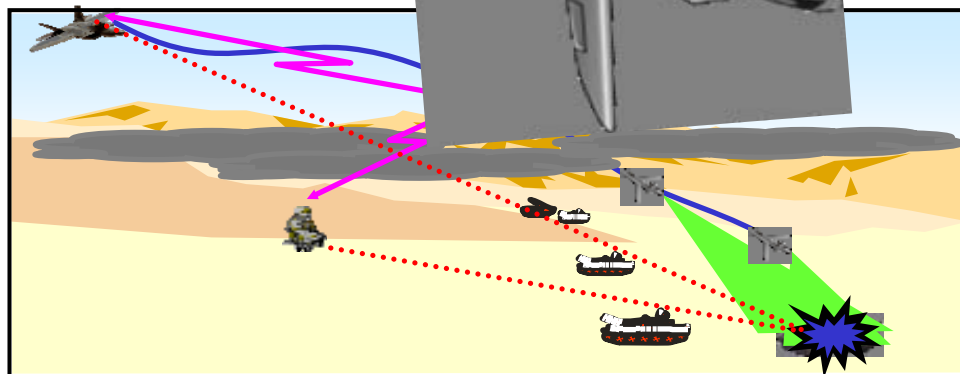
JDAM



SDB



SDB II



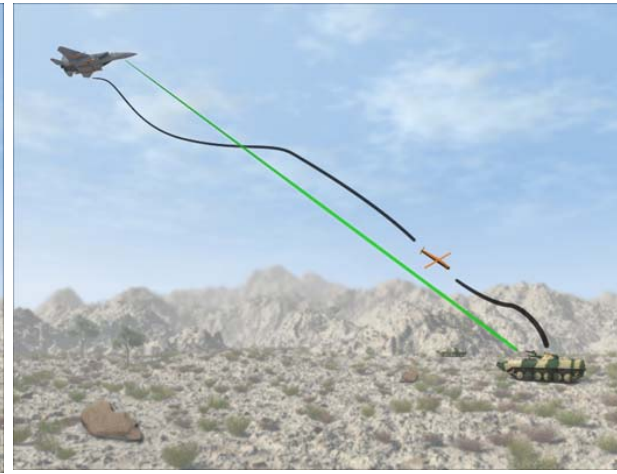
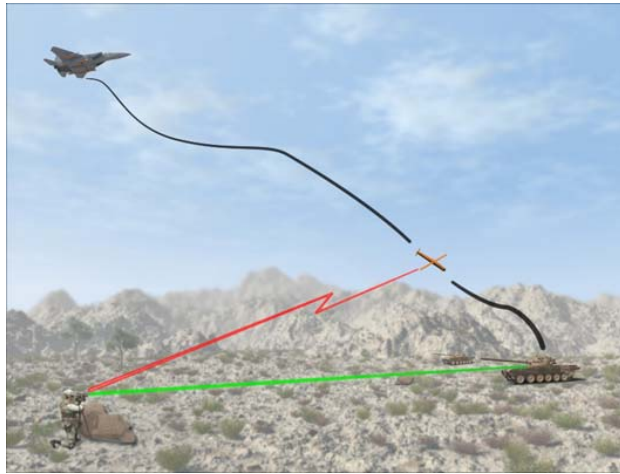
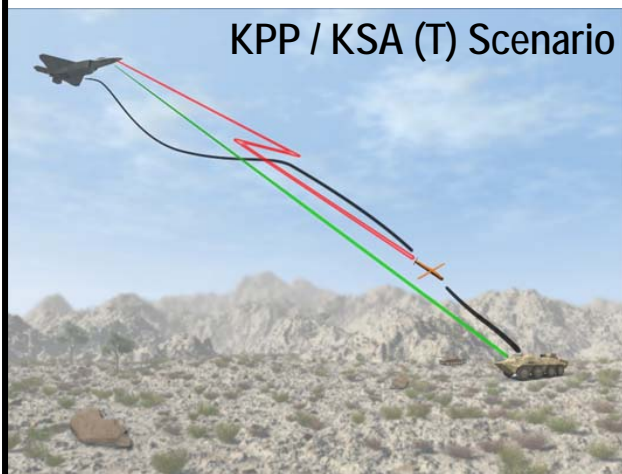


Attack Modes



Normal Attack Modes

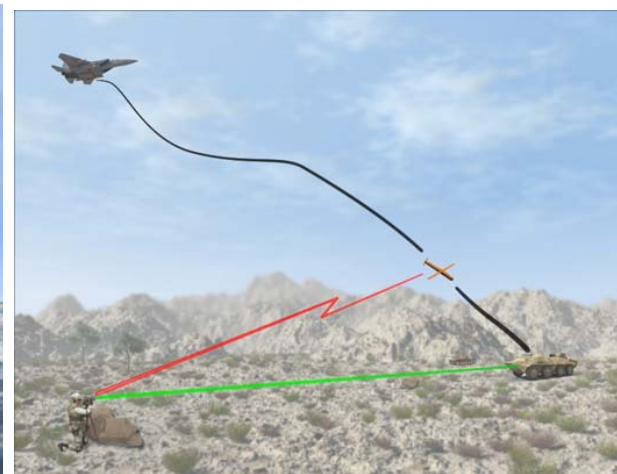
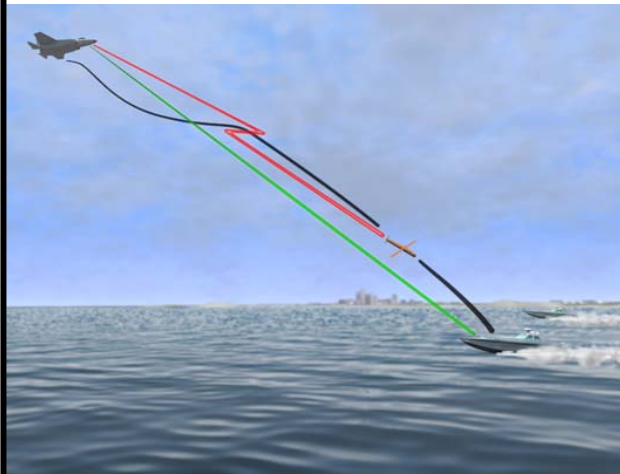
KPP / KSA (T) Scenario



Coordinate Attack



Semi-Active Laser Modes





PEO - Weapons RADAR Scope

- **GWOT Urgent Needs**
- **JASSM Follow Through**
- **Continued Success**
 - JDAM, AMRAAM, SDB
- **New Opportunities**
 - CRIIS, QF-16, MALD-J, HTVSF
- **Program Challenges**
 - MALD, AIM-120D
- **Future - Directed Energy**





GWOT Successes

**Over 30,800 Total Combat Drops OEF/OIF
(JDAM, DSU-33, JPF, SDB, SFW, WCMD)**



- **JDAM**

- FY08: Delivered 11,734 Units – 1,925 Combat Drops
- Proven Ability to End Combat Engagements



- **JPF**

- FY08: Delivered 4,914 Fuzes – 1,412 Combat Drops
- Operational Reliability 98% (95% requirement)



- **SDB**

- 49 Total Combat Drops
- ~40,000 Captive Flight Hours on F-15E

**Government / Industry Team Delivering
Capability to the Warfighter**



DEFENSE THREAT
REDUCTION AGENCY



AFRL MUNITIONS



AIR ARMAMENT CENTER



AFOTEC



53rd WING



33 FW



20th
SPACE
CONTROL
SQDN

NAVY EOD
SCHOOL



COAST
GUARD



ARMY
RANGERS



ARMY
7TH SFG



919th SPECIAL
OPS WING





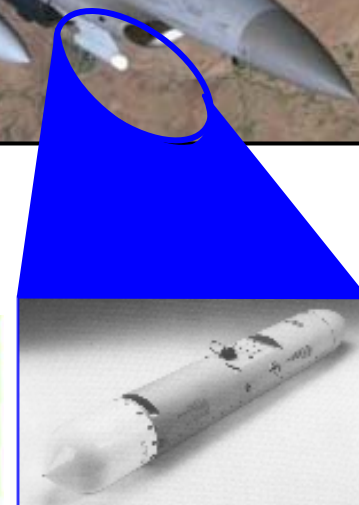
HARM Targeting System (HTS)



- Target/Kill Enemy Radar
- Supports Suppression Of Enemy Air Defenses (SEAD) Wild Weasel Mission Area with HARM
- New R7 Pod Allows PGM Targeting
 - Brings JSOW, JDAM, JASSM, & SDB to SEAD mission
- Operational on F-16CJ
- Entered inventory in 1994
 - Over 200 delivered
- Combat proven in Operation Deliberate Force (Bosnia), Operation Southern/Northern Watch, Operation Enduring Freedom, and Operation Iraqi Freedom



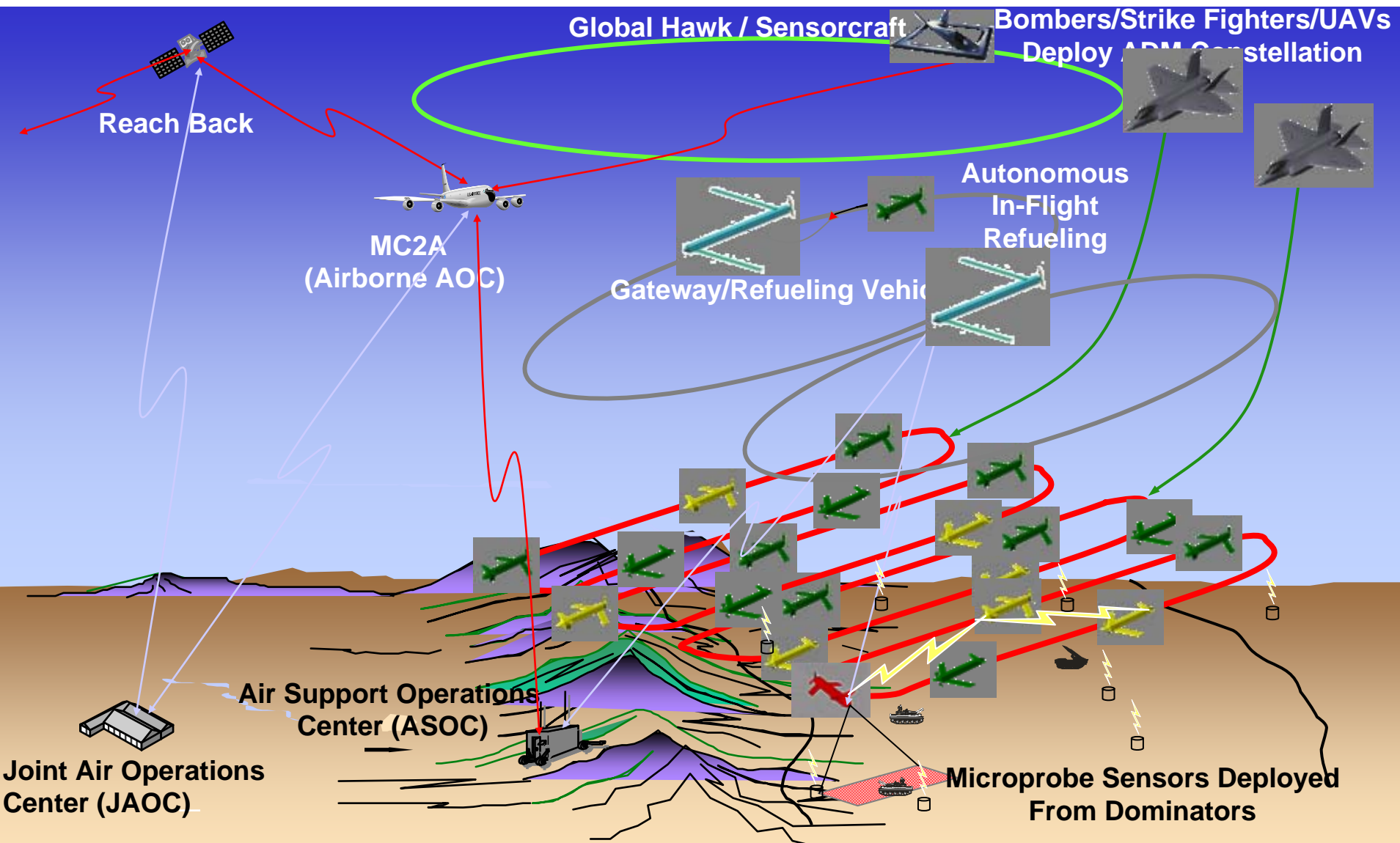
**AGM-88
(HARM)**



HTS Pod



Networked Weapons



Naval EM Railgun Innovative Naval Prototype

Overview

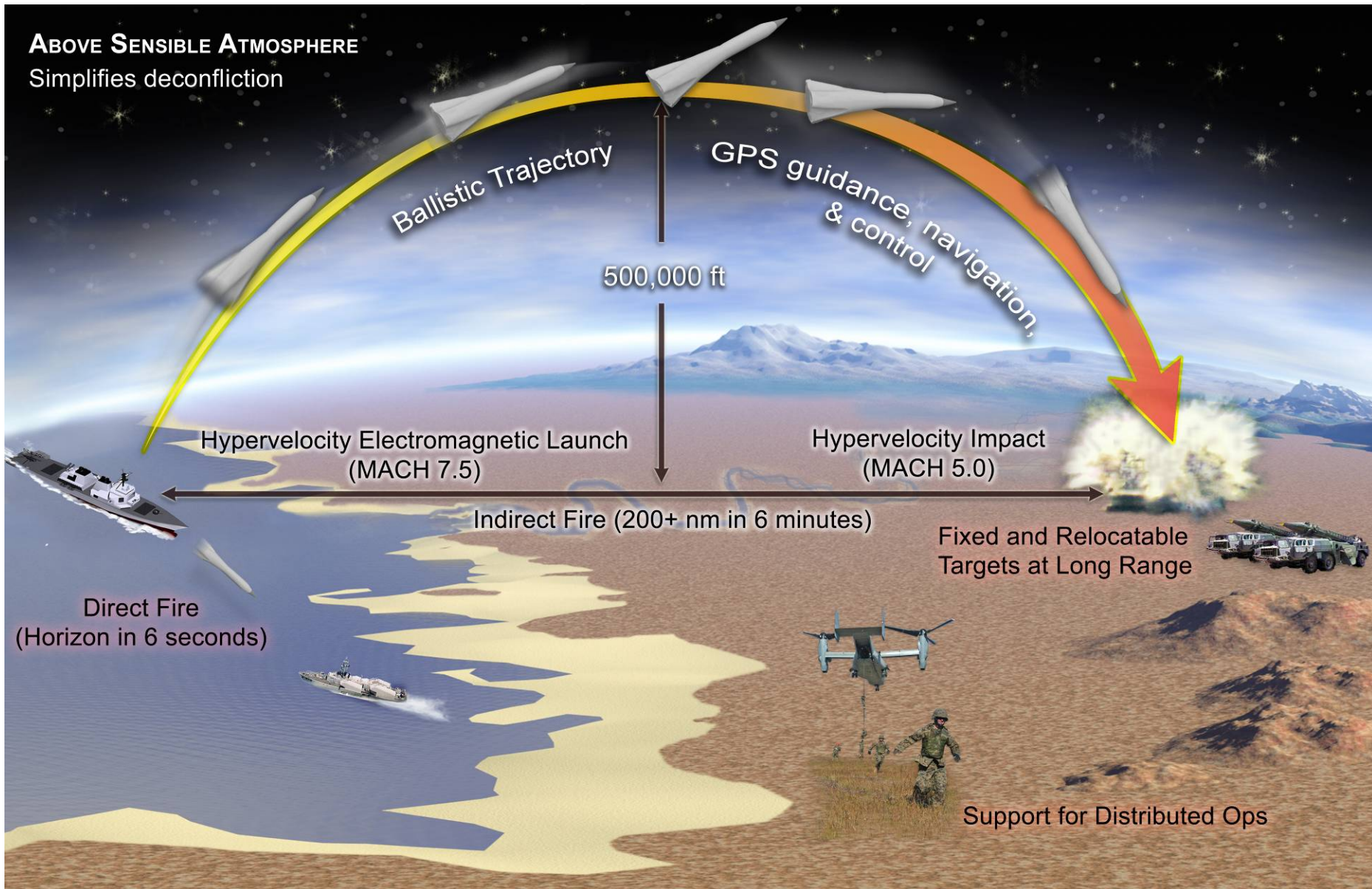
Precision Strike Armaments
Technology Fire Power Forum
June 2008



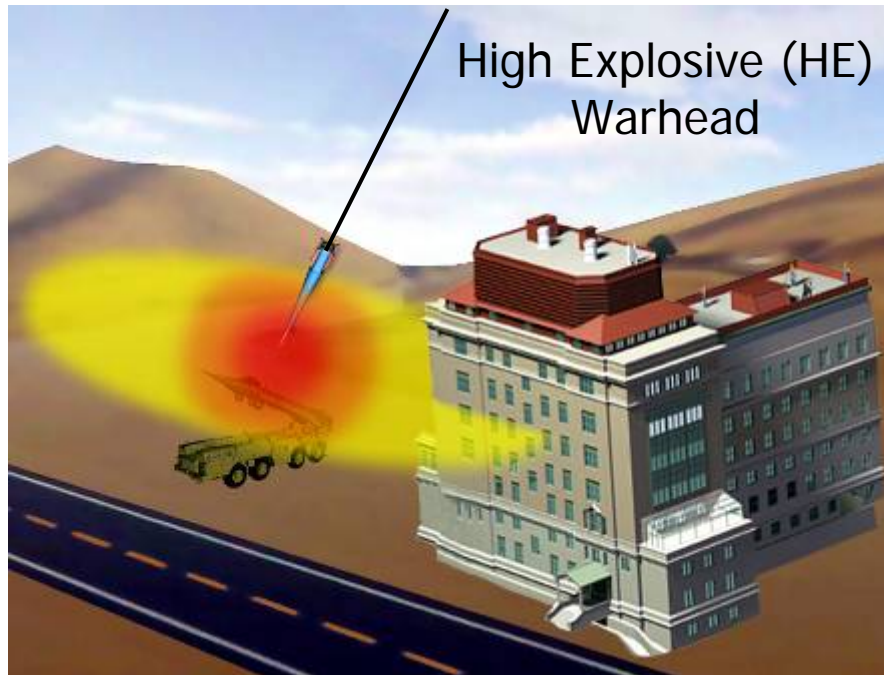
World Record Media Event



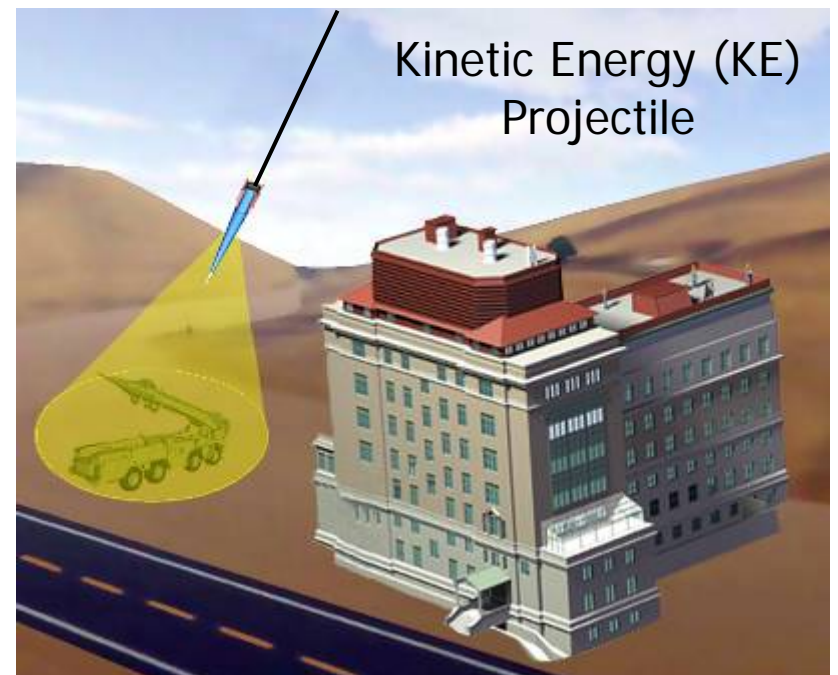
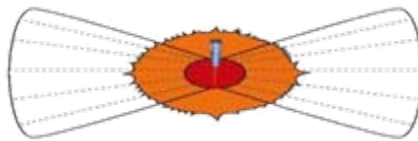
EM Railgun – Game Changing



HE versus KE Projectiles



- Blast Overpressure
- Large Area of Fragment Spray
- High Collateral Damage

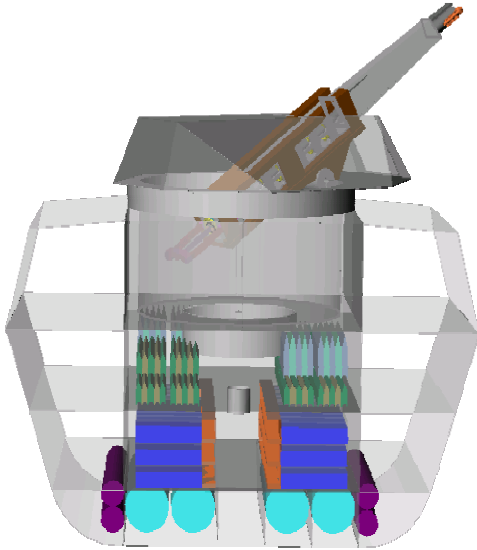


- No Blast Overpressure
- Focused Fragment Pattern
- Minimal Collateral Damage



UNCLASSIFIED

Navy Electromagnetic Railgun



Why is it important?

- Volume & Precision Fires
- Time Critical Strike
- All weather availability
- Variety of payload packages
- Scalable effects
- Deep Magazines
- Non explosive round/No gun propellant
 - Greatly simplified logistics
 - No IM (Insensitive Munitions) Issues
- Missile ranges at bullet prices

What is it?

- Gun fired with electricity rather than gunpowder
- Revolutionary 250 mile range in 6 minutes
- Mach 7 launch / Mach 5 hit
- Highly accurate, lethal GPS guided projectile
- Minimum collateral damage

Who needs it?

- Marines and Army troops on ground
- Special forces clandestine ops
- GWOT
- Suppress air defenses

When?

- Feasibility Demo 2011
- System Demo 2016
- Fielding Objective 2020-2025

Naval Railgun – Key Elements

Launcher



- Multi-shot barrel life
- Barrel construction to contain rail repulsive forces
- Scaling from 8MJ (state of the art) to 32MJ to 64MJ Muzzle Energy
- Thermal management techniques
- M&S – Represent interaction between bore and projectile

Projectile



- Dispensing and Unitary Rounds
- Gun launch survivability
 - 20-45 kGee acceleration
 - Thermal Risk Management
- Hypersonic guided flight for accuracy
- Lethality mechanics

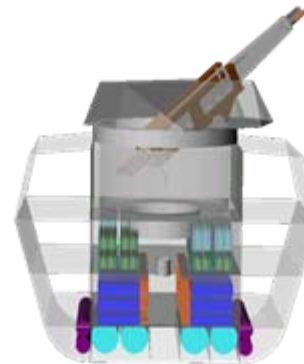
Pulse Forming Network (PFN)



Capacitors or Rotating Machines

- Energy Density
- Rep rate operation & thermal management
- Switching
- Torque management and multi-machine synchronization (rotating machine)

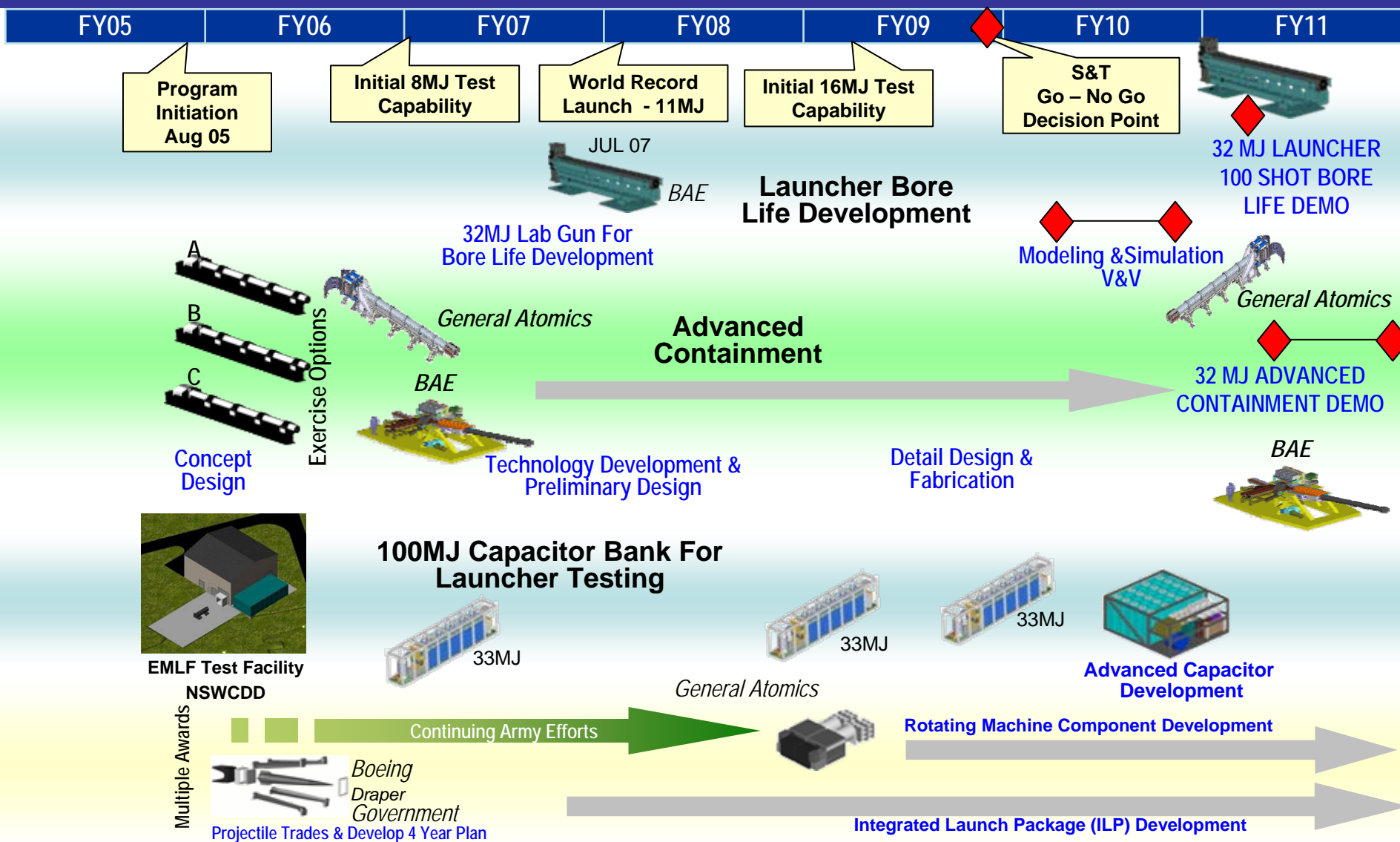
Ship Integration



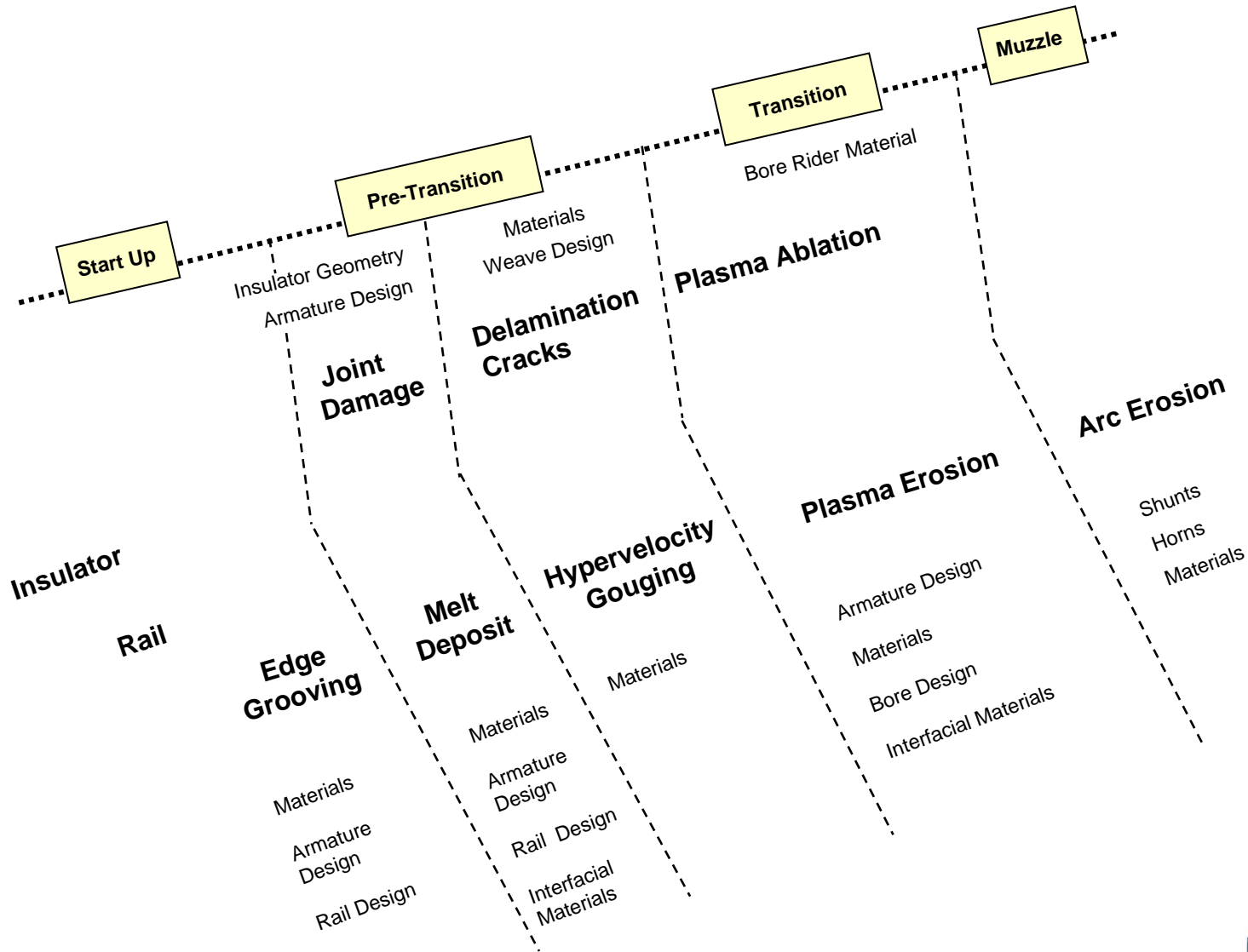
- Dynamic Power Sharing
- Space and Weight
- Thermal and EM Field Management

- Blue – INP Phase 1
- Gray – INP Phase 2

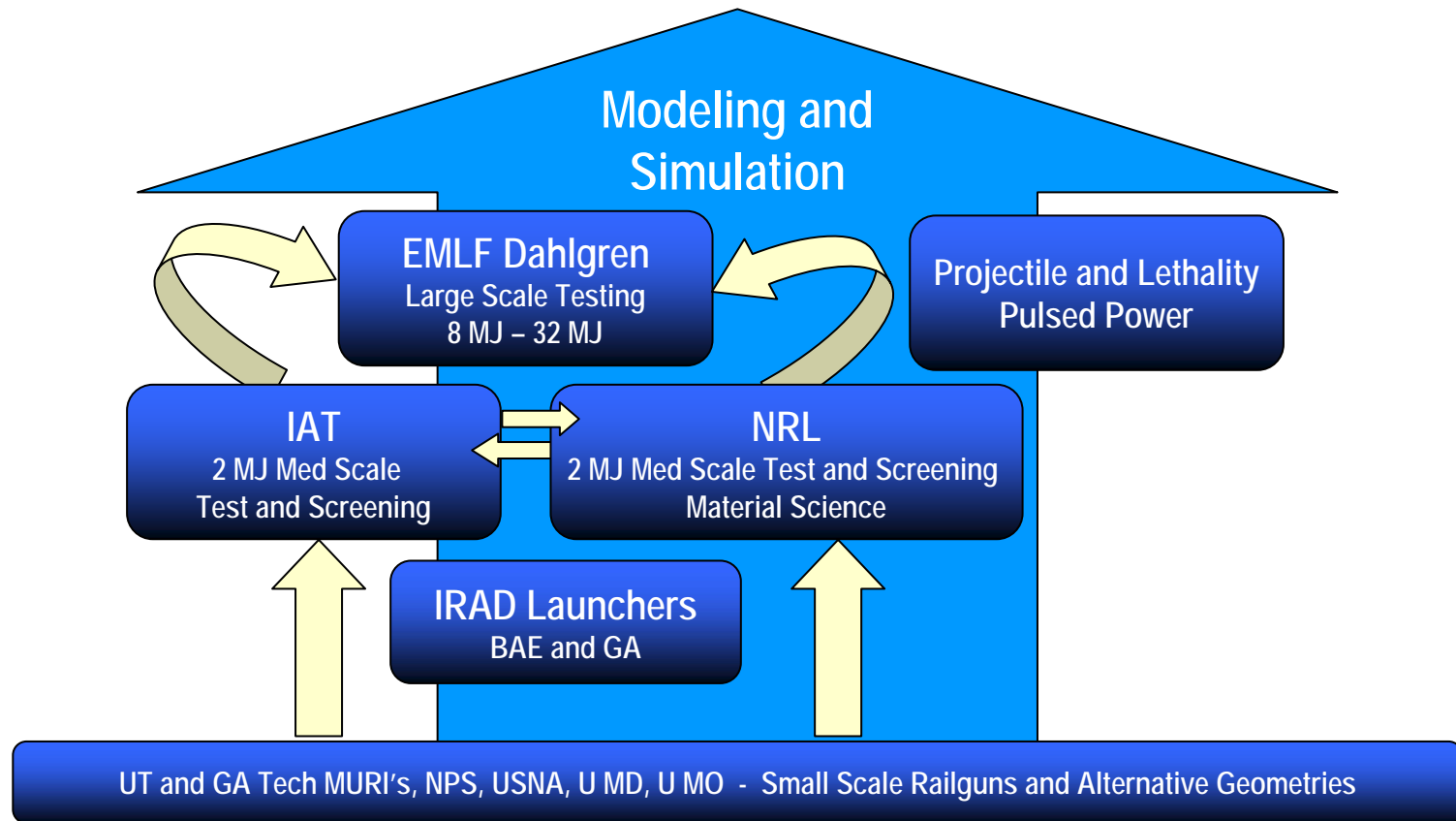
ONR INP Phase I Program



Bore Life Approach



Test and Analysis Concept



- T&E is a multi-tiered effort with basic research conducted at the smallest (quickest & least expensive) scale.
- Promising results are analyzed and promoted to the next appropriate scale for confirmation & maturation.
- Modeling and Simulation
 - Critical element for design
 - Updated after test & analysis results

Bore Life *Electromagnetic Launch Facility (EMLF)*



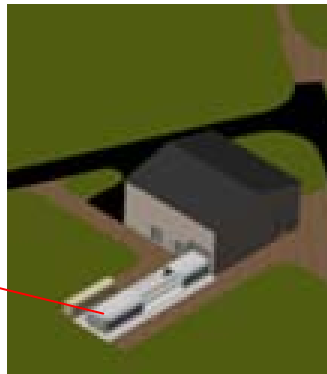
Pulsed Power



High Energy Lab Launcher



Terminal Back-Stop Construction

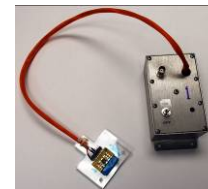
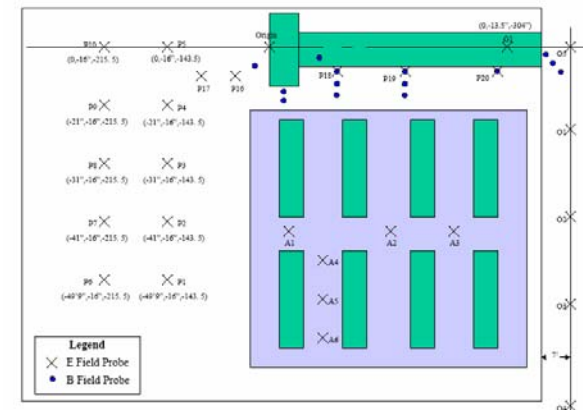


9.8 MJ Shot Fired

Environmental Considerations

- Electromagnetic Interference (EMI)
 - EMI fields at Dahlgren Facility being quantified
 - Field probes in facility
 - Standard computer models
 - Assessment of shipboard impact
 - Industry prototypes to be measured
- Particulates
 - Particulates emitted from launcher when fired
 - Safety procedure followed at labs
 - Particulates studied at Naval Research Laboratory
- Mitigation and safety strategies being developed as required per DoD instructions and Industry standards.

Field measurements inside the Electromagnetic Launch Facility

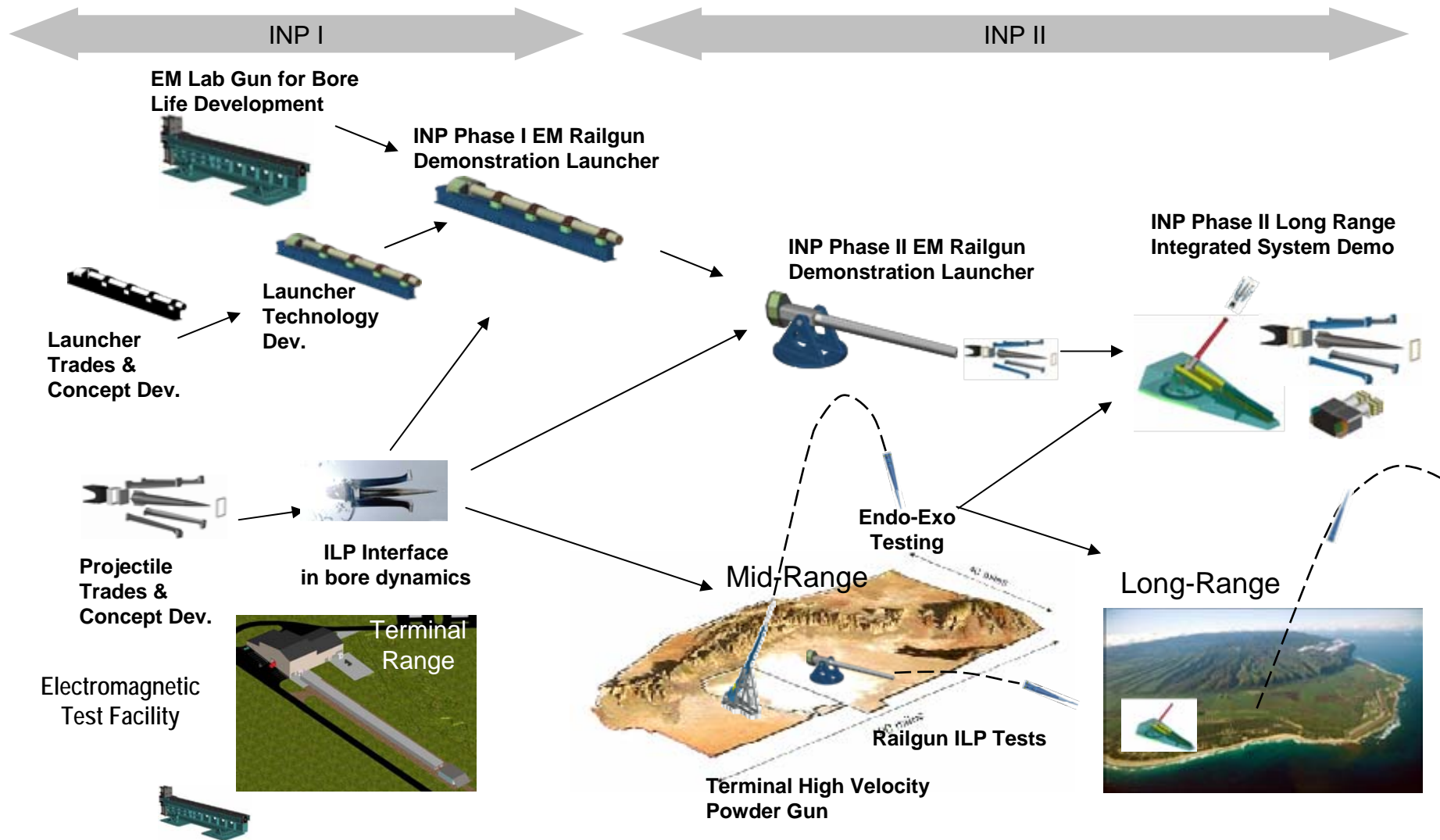


B Field Probe



E Field Probe

Path to Integrated System Demo



Army & Navy Collaboration



A strong collaboration continues to benefit both programs, increasing political stability, execution efficiency, and technical achievement.

Summary

- Naval EM Railgun is a “Navy after Next” Game Changer
- Navy & Army EM Railgun Collaboration
- Risk Mitigation
 - Establish Bore Life Consortium
 - Advanced Containment Launchers – Competitive solutions
 - Integrated Launch Package (ILP) and Projectile development
 - Understand Ship and Weapons System Requirements Integration

Challenges Understood and Being Addressed

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U.S. Army Research, Development and Engineering Command



Malcolm Baldrige
National
Quality
Award
2007 Award
Recipient

The logo for the Malcolm Baldrige National Quality Award. It features a large, stylized gold star on the left, with the text "Malcolm Baldrige National Quality Award" and "2007 Award Recipient" to its right. The background is a dark red banner with a faint world map and binary code.

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.

Future Ammo Logistics Initiatives

11 June 2008



Ammunition Logistics R&D Strategic Plan



OBJECTIVE:

- ❑ Develop strategy for ammunition logistics system improvements
- ❑ Synchronize current and future US Army ammunition logistics R&D efforts
- ❑ Develop organizational relationships between key ammunition logistics system stakeholders
- ❑ Leverage and develop joint programs with other Services and Department of Defense programs



Multi-agency Six-Sigma IPT





Joint Modular Intermodal Distribution System (JMIDS) Joint Capabilities Technology Demonstration (JCTD)



JMIDS - A system of standard sized multimodal modular containers, platforms, and off the shelf information tags



Benefit – JMIDS enables rapid/“seamless” movement of supplies by air, land and sea



Mission: Evaluate JMIDS Military Utility and transition to program of record

Participants

Lead Service: ARMY ARDEC

Partnering Service: US Navy

Sponsoring CoCOM: USTRANSCOM

Technical Manager: ARMY, ARDEC

Operational Manager: TRANSCOM, J5

Deputy Op Manager: USACASCOM

Indep.Test Agency: COMOPTEVFOR

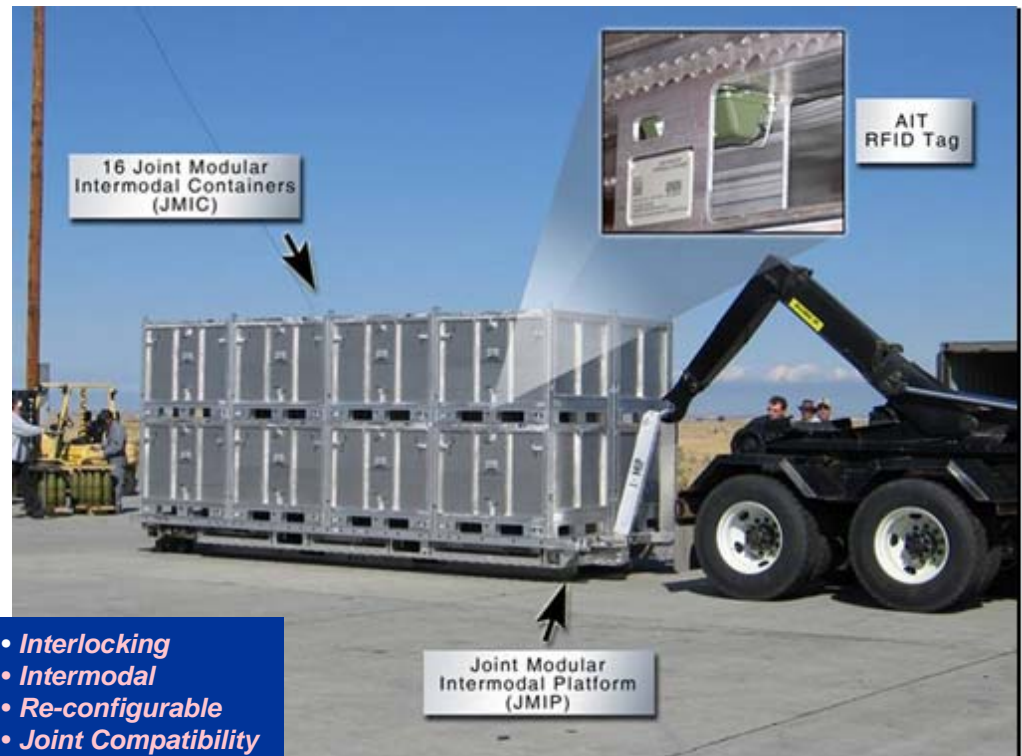
Transition Manager: ARMY, ARDEC

Program of Record: ARMY, PM-FSS

DoD Agencies: DLA

Supporting Services: USMC, USAF

Supporting CoCOMs: JFCOM



- Interlocking
- Intermodal
- Re-configurable
- Joint Compatibility

TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



JMIDS

A System of New Capabilities



JMIP

SPINOFF CAPABILITIES

AIT

JMIC



Moveable
Tie-down
Rings



Collapsible
Container
Interlocks



Adaptable
Aircraft
Interlocks



AIT Nesting



Satellite
Tracking



RFID
Sensor
Tags



Manual/Auto
Tie-down



STD
Size/Configuration



Collapsible



Helo
Sling-Lift



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



JMIC Capabilities



FEATURES



TYPE I



TYPE I COLLAPSED



TYPE III



STACKABLE
INTERLOCKABLE
TOP LIFTABLE



JMIC EQUIPPED
WITH DRAWERS
AND CASTERS

- * Integrated tracks for ISO-7166 fittings internal and external
- * Collapsible to 113 height without tools
- * Lockable panels, removable for content access, even while stacked
- * Top liftable and interlockable
- * AIT - integrated protected location
- * 4-way fork truck & pallet jack entry
- * Accessories - lock in casters, bins, shelves, and more ...

HANDLING & SHIPPING

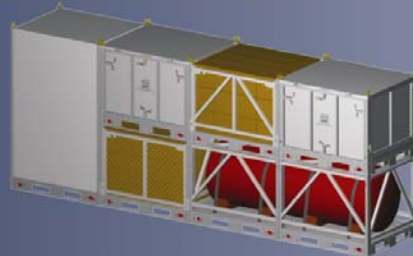


LAST TACTICAL MILE
* CARGO ACCESSIBILITY



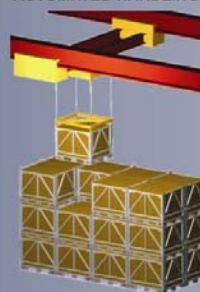
- * Rapid Ship Upload without reconfiguration
- * APPROVED for vertical and connected ship - ship replenishment
- * Compatible with all classes of supply - throughout DOD
- * Size optimized for ISO containers - 16 JMICs in a 20' with minimal dunnage
- * Eliminates the need for repackaging - Ability to span the COMPLETE logistic cycle to the "LAST TACTICAL MILE"

SYSTEM FLEXIBILITY



MIXED SIZES AND TYPES

AUTOMATED HANDLING



TRAILER WITH
INTERLOCK
FITTINGS



- * Multiple size JMIC capability - double long, double high, ...
 - * Varied types - including user defined special purpose JMICs
 - * Stackable and interlockable - varied sizes and types
- Future Capabilities:**
- * Automated Storage & Retrieval Systems
 - * Trailers, flatracks, and magazine decks, equipped with integrated interlock fittings - eliminating chains, and straps



Joint Modular Intermodal Configuration

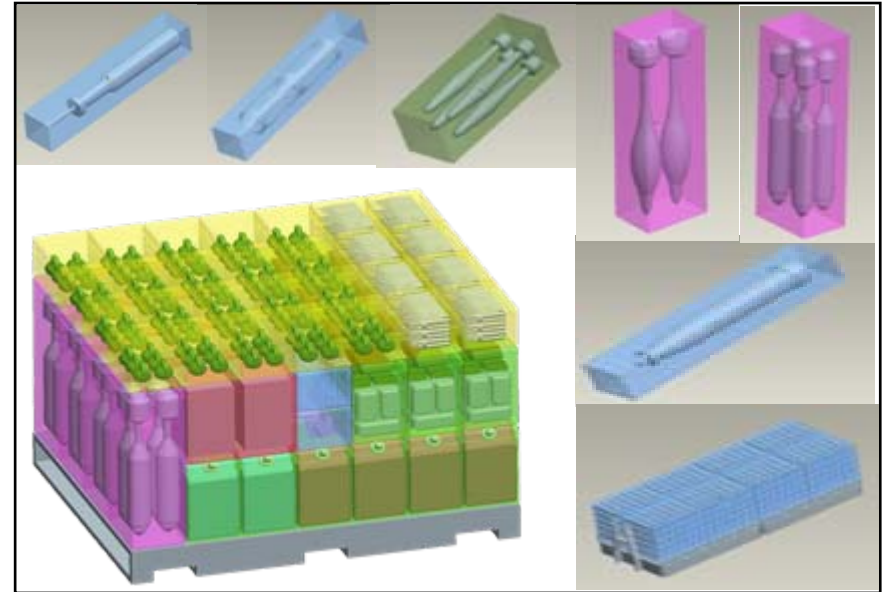


Current

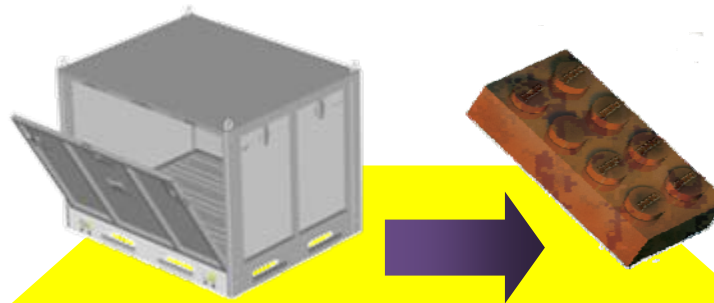


- Containers are all different sizes
- Requires slow and manpower intensive blocking, bracing and strapping

Future Vision



- Standard size containers
- Six standard sized sub-module containers will accommodate nearly all munitions and other supplies



Bridging the Gap to Future Packaging



Large Caliber Ammunition Resupply

**Objective: Conduct unmanned resupply of FCS Manned Ground Vehicles:
NLOS-C, MCS & NLOS-M**



- JMIC & HEMTT-LHS Compliant
- Autonomous Re-supply of main weapon ammo only
- Interface with ammo in legacy packaging



Freedrop Packaging Concept Project (FPCP)



Objective: Conduct Emergency Freedrop resupply from moving helicopters at low altitudes

Goals:

- Inexpensive-\$100 per package
- Low altitude drops - 50 to 100 feet
- Hovering or moving 65 to 130 knots
- Easily recovered by 2 Soldiers w/o MHE
- 100% Survivability

Accomplishments:

- Conducted prototype drop tests at Rutgers U & Tobyhanna AAD
- Transition Agreement with PM FSS



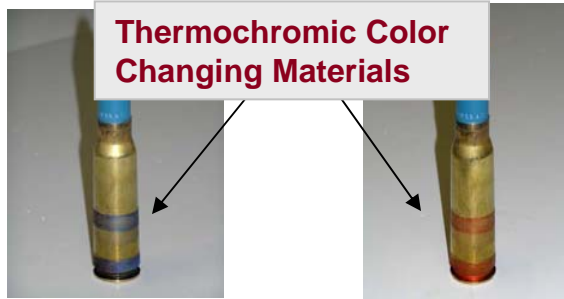
Cooperative effort in support of G-4 - Logistics Innovation Agency



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



Objective: Develop a suite of solutions from low tech low cost to high tech to enhance confidence of munitions readiness throughout it's lifecycle



- Irreversible visual indication of temperature exposure
- Research to tailor the materials for various temperatures and exposure times



- COTS Passive shock sensor
- Range needs to be increased to meet Ammo requirements



- Electronic sensor device developed by PNNL
- Prognostic Algorithms can be integrated into the device
- RF or hardware interface
- Downloads to ASIS-MHP

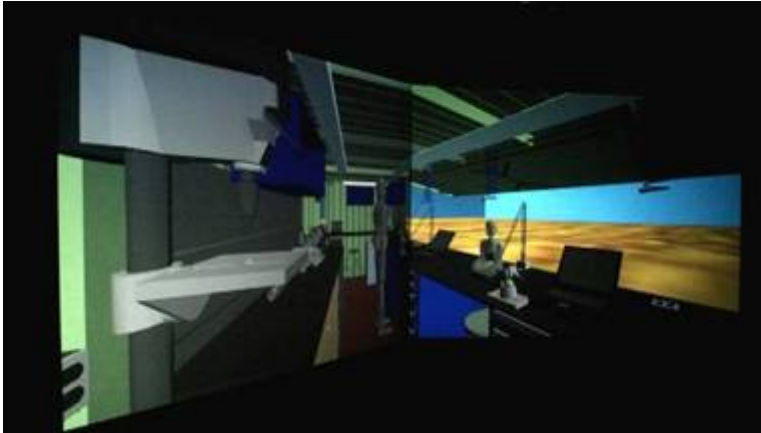


Joint Modular Intermodal Distribution System - AIT

- Introduced temperature and humidity enable RFID TAG at the pallet level compatible with ITV server
- Evaluated Satellite communication tags



Virtual Engineering Center



ARDEC Collaboration Centers



ARDEC Advanced Visualization Center

- Established at Picatinny & Rock Island
- Helps customers to evaluate design concepts, accelerate project schedules and saves time and money by eliminating costly building of physical models
- Supported PM-SKOT & USMC maintenance system design projects



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



Tactical Ammunition Accountability

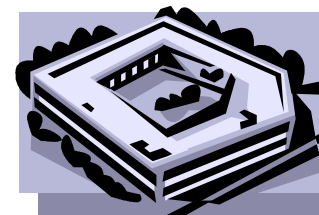


PROBLEM: Ammunition accountability brigade and below lack accuracy & timeliness resulting in suboptimal logistics related actions. Updates are manual, ad hoc and infrequent and therefore not conducive to anticipatory resupply.

Brigade Tactical Op Center
Property Book Unit Supply Enhanced (PBUSE)

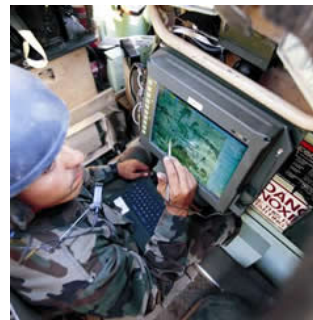


**Accurate Data = Improved
Decision Making & Responsiveness**



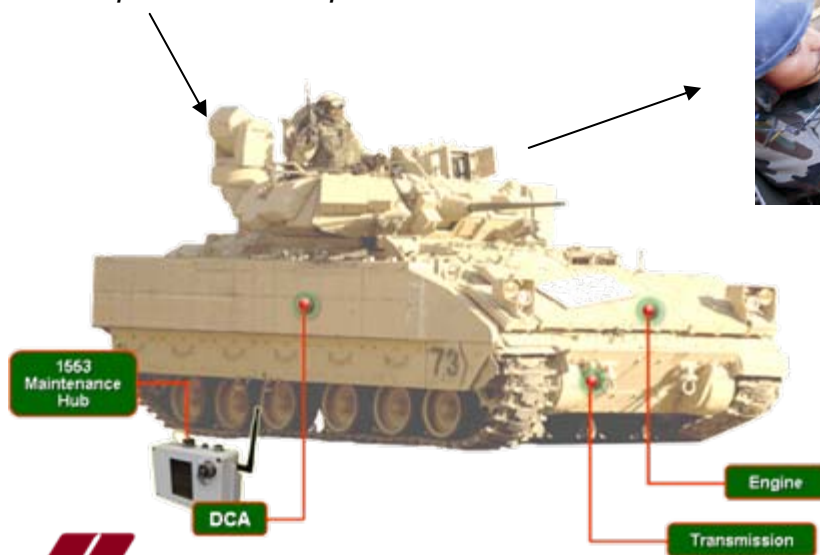
**National Inventory
Control Point
Accountable System**

**Ammo Data sent
via Vehicle's FBCB2**



**Bradley
Paladin
Abrams**

*Round counting sensors and/or
modified Fire Control Software
capture ammo expenditures*



For Health Management System (VHMS) equipped vehicles

Leveraging:

- **Benet Labs Barrel Fatigue Sensors**
- **PM-HBCT VHMS**



TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



**IM Explosive and Venting Technologies help mitigate thermal threat
(Example: Slow Cook-off test result)**



Without IM Technologies

**Recent incidents remind us of the seriousness
of explosive safety
We don't need another Doha !!!**



With IM Technologies





LRED 3-D Technology Integration and IETM Application



Ammunition Adage



A Soldier can survive in Combat



Forever Without Mail



30 Days Without Food



3 Days Without Water



3 Minutes Without Air



But Not One Second Without Ammunition!



Contact Information



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TECHNOLOGY DRIVEN. WARFIGHTER FOCUSED.



U.S. Army Munitions HQ DA G-3/5/7



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Agenda

- DA G-3/5/7 Munitions Mission
- Current Operational Trends and Observations
- Munitions Requirements Process (MRP)
- Major On-going Actions/Initiatives



DA G3 Munitions Mission

- Serve as Army Staff focal point for integrating all munitions issues
- ARSTAF Team of Teams = G-3/5/7, G4, G8 and ASA (ALT)
- Where do we focus?
 - ✓ Determine ALL munitions requirements
 - ✓ Sustain the warfight
 - ✓ “Operationalize” munitions issues and recommend priorities
 - ✓ Coordinate munitions resourcing strategy
 - ✓ Synchronize munitions policy
 - ✓ Oversee Army weapons training program
 - ✓ Monitor munitions and industrial base readiness



Munitions “Team of Teams”

Validation, Prioritization, Resourcing, Policy

G-3/5/7

- CIC: **Capability Rqts**
- SSW: **War Plans**
- FM: **Force Structure**
- TRA: **Develop Requirements**
- CIR: **Develop priorities**

G-4

- Sustainment**
- Munitions Div

G-8

- Programming & Budgeting**
- BOS Div's (Missiles)
 - Ammunition Div

ASA(ALT)

- Acquisition & Program Management**
- Missile Systems & Ammunition Directorate

Requirement Generators

DoD
MRP

Joint Staff
JCIDS

AR2B

Long-Term

TRADOC

STRAC, POI, CBT Loads

CAA
QWARM

ATEC
TEST

OTHER CMDs
ONS

Near-Team

Integration

Acquisition and Logistics

AMC

AMCOM
LCMC

Life-Cycle Mgr of Acquisition & Production of Missiles, Logistics Readiness, and Sustainment

JM&L
LCMC

Life-Cycle Mgr of Acquisition & Production of SMCA, Logistics Readiness, and Sustainment



Current Operational Trends and Observations



Current Operational Trends and Observations

- Modernization of conventional munitions stocks is well underway; missile stocks are approaching obsolescence.
- Our inventory is not necessarily tuned for “full spectrum” operations, and change is slow going (e.g. 2.75” rockets, 40mm NL).
- We must not “prepare” for the last fight (2.75” rockets, VL/IR Illum).
- We must be more responsive to rapidly changing Tactics, Techniques and Procedures to support the current warfight and persistent conflict (e.g. 2.75” flechette rockets, Blast/Frag Hellfire).
- Anti-armor does not always equal anti-personnel.
- Phase IV Operations and “Persistent Conflict” require more than small arms (e.g. demo, precision-guided munitions, non-lethals, etc.)
- Joint and Coalition munitions planning and training is critical. Technology cannot outpace slowest runner (7.62 Dim Trace, Aphids)



Current Operational Trends and Observations

Continued...

- We are and will continue to fly (fixed and rotary) 155mm and more (intra and inter theater)
- Buying foreign to make up for shortfalls should never happen again (e.g. UK small arms)
- Ammunition Foreign Military Sales (FMS) are on the rise and must be leveraged for; Strategic Shaping/Coalition building and Industrial Base readiness
- Reduction in inventory (due to overall reduction in force structure, increased lethality and precision) has led to a greater reliance on near real time inventory and expenditure data (not there yet)
- Non-lethals must quickly transition to lethal effects to best support Escalation of Force, detainee operations, etc. (no more FN303's). Extended range (150m) for NL is critical to buy standoff time.



Current Operational Trends and Observations

Continued...

- Just in time production does not equate to just in time logistics
- Precision vs dumb munitions balance is not easy. TRADOC is conducting a detailed study to support senior decision makers
- TRADOC also working a study to help focus PEO- Missiles and Space RDT&E and S&T funding requests in FY12-17 POM
- Operational Needs System (ONS) system is working
- Significant increase in ammunition and explosive related accidents with fatalities
- We have a knowledge gap among junior to mid-grade officers



Munitions Requirements Process (MRP)



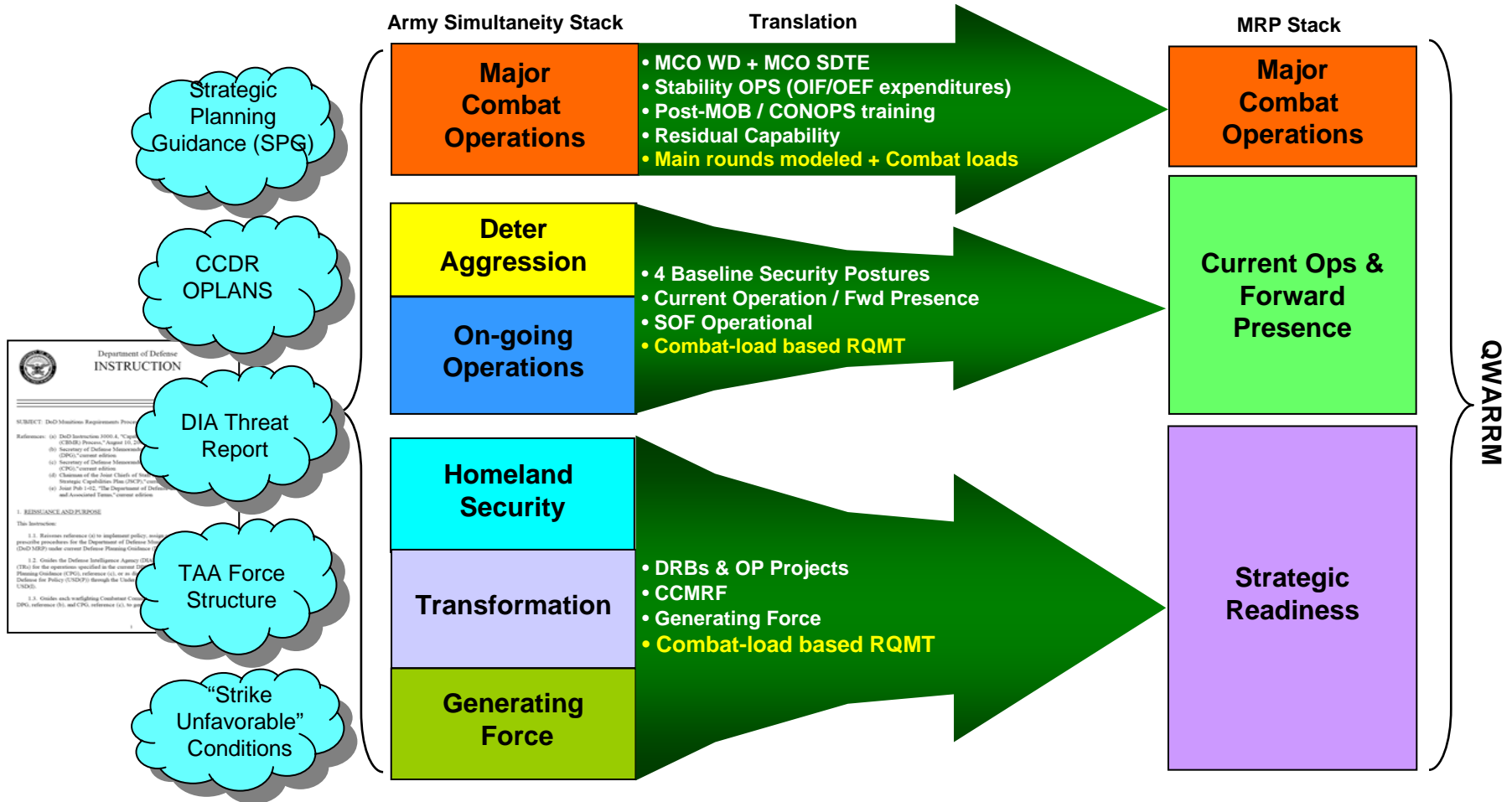
Munitions Requirements Process (MRP)

- DoD Instruction 3000.4, Munitions Requirements Process (MRP), directs all Services to develop munitions requirements biennially.
- The MRP is a deliberate planning process that supports long-range POM planning and investments.
- As part of the deliberate planning process, we use the “Quantitative War Reserve Requirements for Munitions” (QWARRM) process to develop War Reserve / Operational requirements.
- The Center for Army Analysis (CAA) conducts theater-level modeling based on input from multiple sources including:
 - Strategic Planning Guidance
 - COCOM OPLANS
 - DIA Threat reports
 - Projected Force Structure
 - Approved / projected munitions
 - Munitions caps
 - Approved Combat Loads (CL)
 - Munitions / system performance data
- Training and test requirements are developed separately from the QWARRM process.



QWARRM Development

Account for Everything; Double-count Nothing





Munitions Requirements Process (MRP)

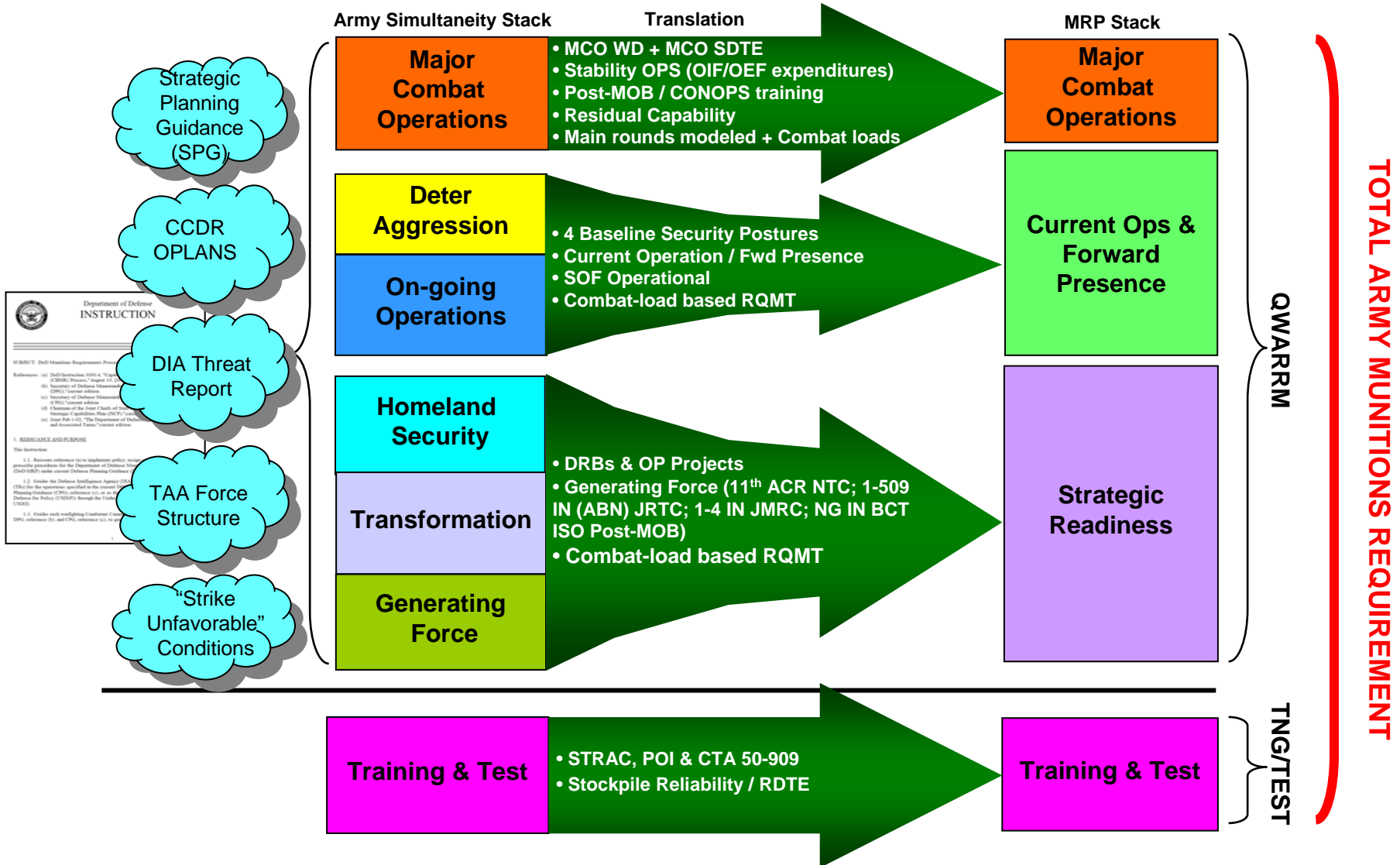
Continued...

- QWARRM does not address immediate operational needs. These are approved and resourced through the Army Requirements and Resourcing Board (AR2B) via Operational/Urgent Needs Statements (ONS/UNS) (e.g. Pen Flares)
- QWARRM requirements + training (6 years) + testing (6 years) = Total Army Munitions Requirements (TAMR)
- FY10-15 TAMR provided to OSD o/a 1 Jan 08



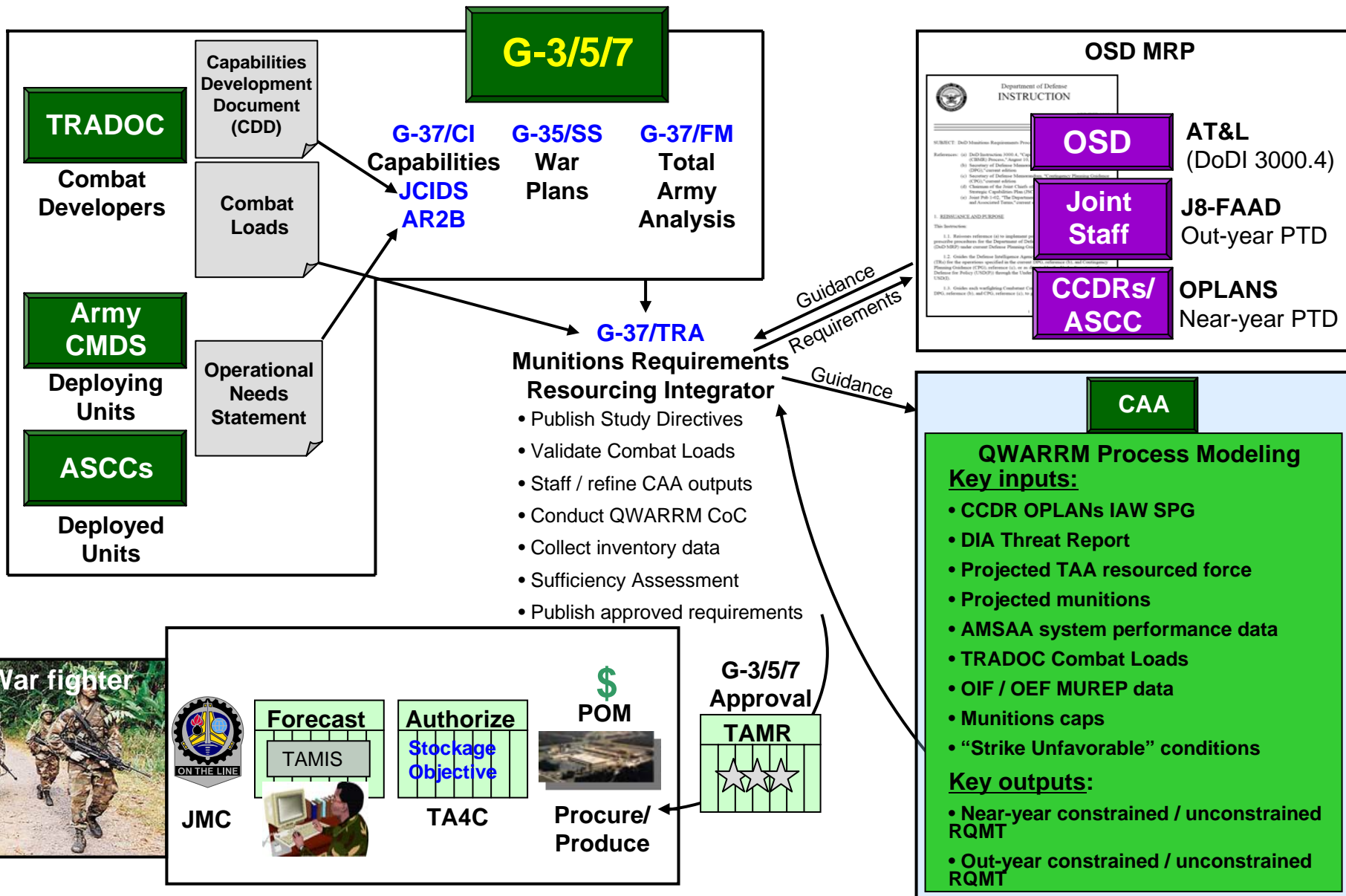
Total Army Munitions Requirements (TAMR)

Account for Everything; Double-count Nothing



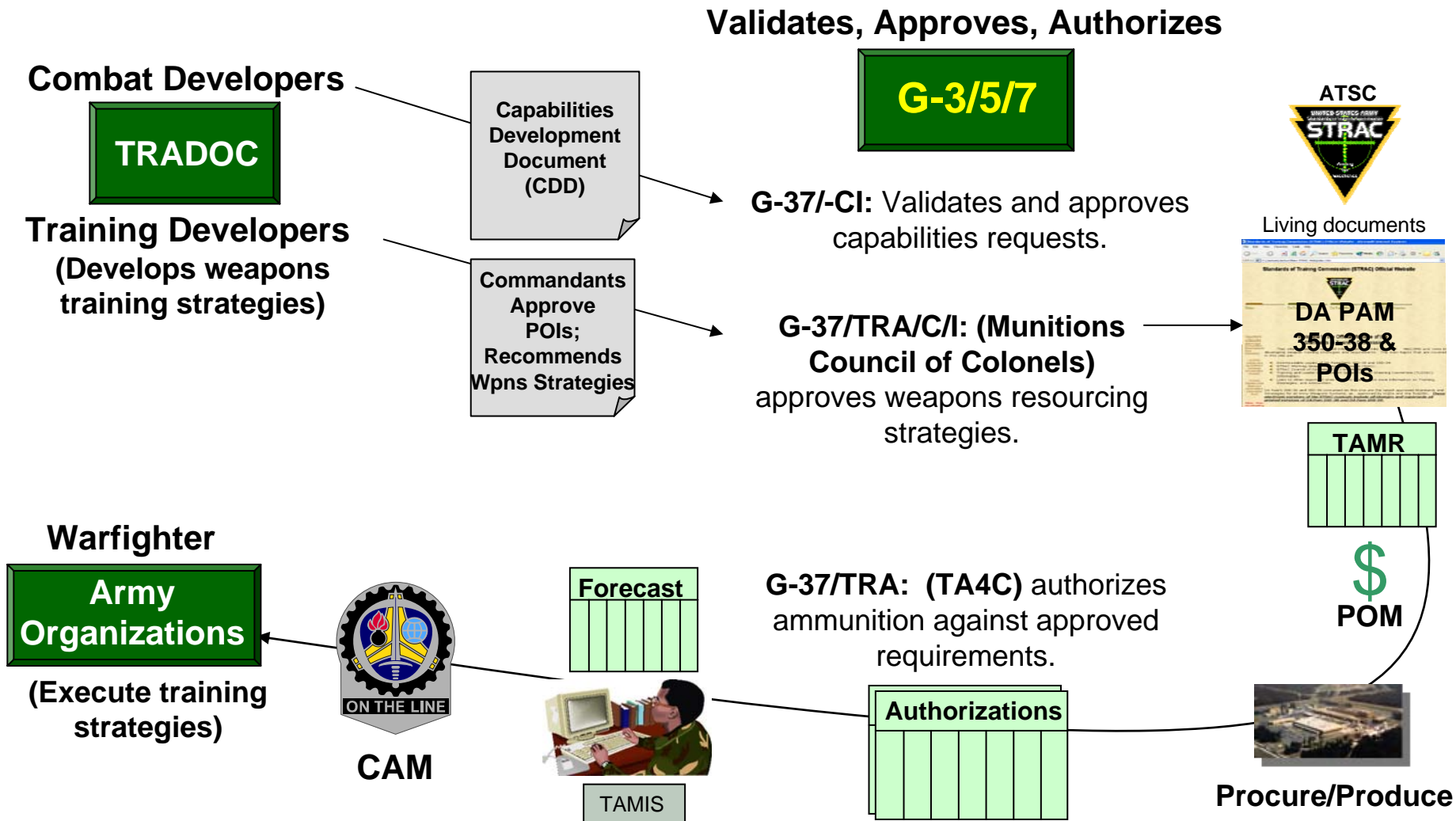


Army War Reserve / Operational MRP





Training Munitions Requirements Process





On-going Actions/Initiatives



Ongoing Actions/Initiatives

➤ Sustain the Warfight

- Hellfire (AP/AT)

- 2.75" rockets (HE, flechette)

- 30mm

- Fast Obscurant Grenade (FOG)

- Unitary Guided MLRS

- Excalibur

- 12ga breaching rounds

- Non-lethal (40mm, CS, 12ga)

- Escalation of Force (EOF)

➤ Manage Army Munitions Requirements and Prioritization

- Green Ammo

- COCOM missile distribution

- ATACMS shelf life extension program (SLEP)

- Operational Needs Statements (e.g. PGMM, Thermo LAW, PGK)

➤ Army Munitions Strategy

- Overarching Army Munitions Strategy

- Highlight current and pending shortfalls

- Munitions/Missile Industrial Base

- Support Reposture/Reset of munitions stockpile

- Joint Materiel Release Process

- Currently Working DRAFT

➤ FY10-15 POM / Total Army Munitions Requirements (TAMR)

- QWARRM is our war reserve munitions requirements development process

- Developed IAW Department of Defense Instruction 3000.4, Munitions Requirement Process (MRP)

- OSD AT&L Implementation Guidance dictates Defense Planning Scenarios for use in MRP

- Training Ammunition requirements developed IAW STRAC and TRADOC POI's

➤ Army Ammunition Vision- 2030

- Soldiers/Civilians

- Training

- Strategic reach back

- Equipment

- Organizations

Chief of Ordnance initiative
Committed to fixing knowledge gap



Don Chrans DA G8 Programming and Budgeting

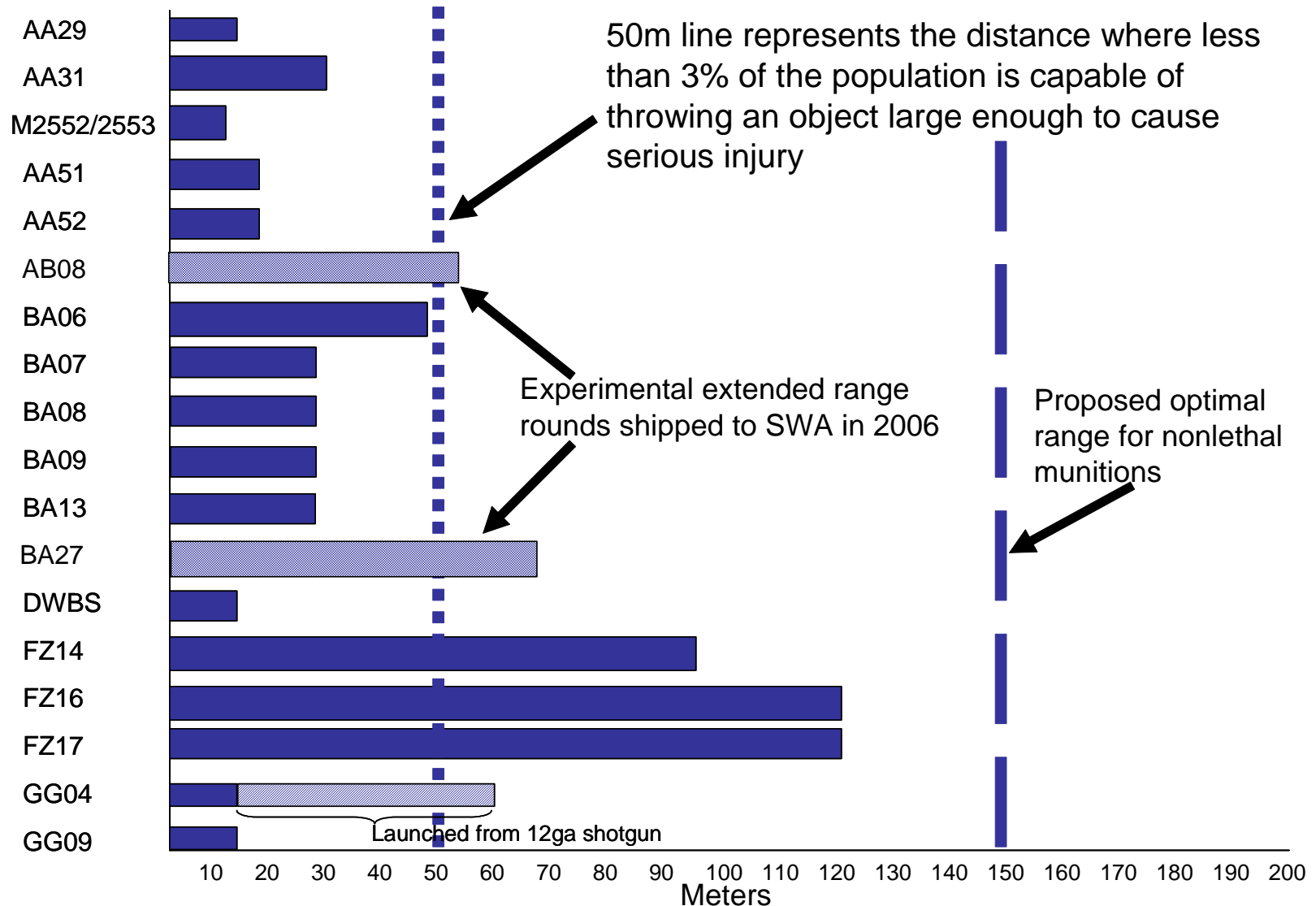


Backup



Non-Lethal Munitions Today

Nonlethal Munition Maximum Effective Ranges





Modeling Guidance to CAA

- Model OSD-directed Major Combat Operations.
- Develop constrained / unconstrained near- and out-year requirements.
- Use MUREP to develop PH IV requirement.
- Develop Strategic Readiness requirements, to include Homeland Defense, treaty obligations, etc.
- Update the Theater Sustainment Model to reflect munitions needed to support a modular force.
- Special emphasis items include: FCS systems, Patriot, ATACMS, Hellfire, DPICM (all types), 30mm, 25mm, and Precision Guidance Kit (PGK) requirements.



FY10-15 POM Missile Requirements Methodology

- Previous missile requirements process was fiscally driven vice operations-based.
- G-3/5/7 can't determine where he may have risk.

OLD PROCESS

G8 develops missile requirements

Unconstrained:

- CAA model allowed to fight theater war fight without constraint.
- Model defaults to the most lethal, suitable weapon / munition available for the target set.

Constrained:

- Requirements based on programmed quantities.
- Provided by EE PEG BOS reps.
- No missile UFRs. Procurement = requirement.

Note: OSD directs each Service to provide unconstrained and constrained requirements.

NEW PROCESS

G3/5/7 develops missile requirements

Unconstrained:

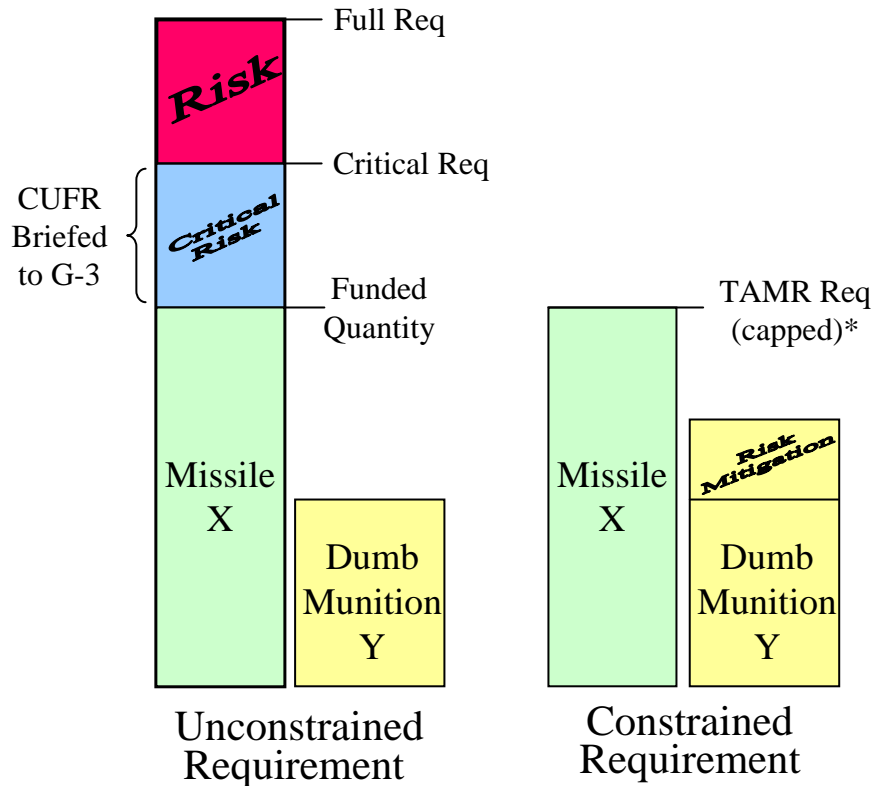
- No change.

Constrained:

- CAA models unconstrained requirement.
- **G3 (DAMO-TRA) develops operations-based critical requirement.**
- **DAMO-TRA briefs proposed RQMT to G-3/5/7 for approval.**
- **EE PEG provides assessment of how much of the RQMT it intends to fund.**
- CAA models programmed quantities provided by EE PEG BOS reps.
- **Funding < critical RQMT = CUFR.**
- **Funding > CUFR but < full RQMT = UFR.**



Constrained Requirement Development



* Missile X TAMR requirement will be the capped qty, but show the Full and Critical Requirements for reference

Unconstrained Requirement

- CAA model is allowed to fight theater level war fight without constraints
- This is the very top level munitions requirements estimate, by DODIC

Constrained Requirement

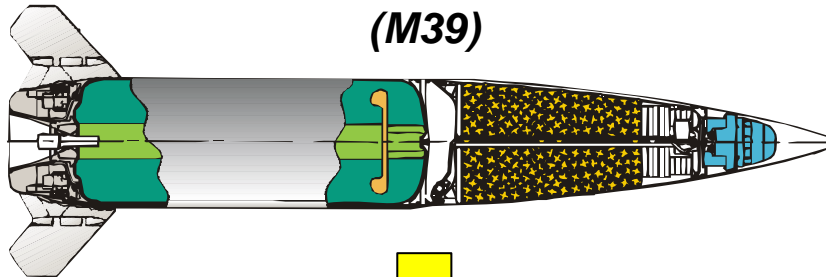
- G-37/TRA uses the CAA generated unconstrained requirement to develop an operations based Critical Requirement
- EE PEG provides assessment of how much of the RQMT it intends to fund
- Critical Requirement is briefed to G-3/5/7 leadership for approval
- CAA models programmed quantities provided by EE PEG BOS
- CUFR = Funding < Critical Requirement
- UFR = Funding > CUFR but < Full Requirement



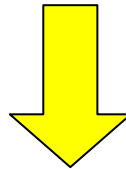
ATACMS SLEP Process

**ATACMS Block I
(M39)**

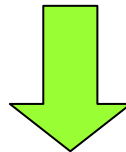
Expired Missile



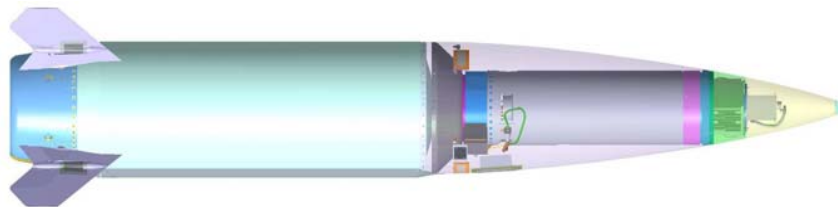
- 950 APAM Sub-munitions
- 165 KM Range
- Inertial Guidance



SLEP PROCESS
(New Warhead, New Electronics, New Guidance System)



New Missile
10 Year Shelf Life

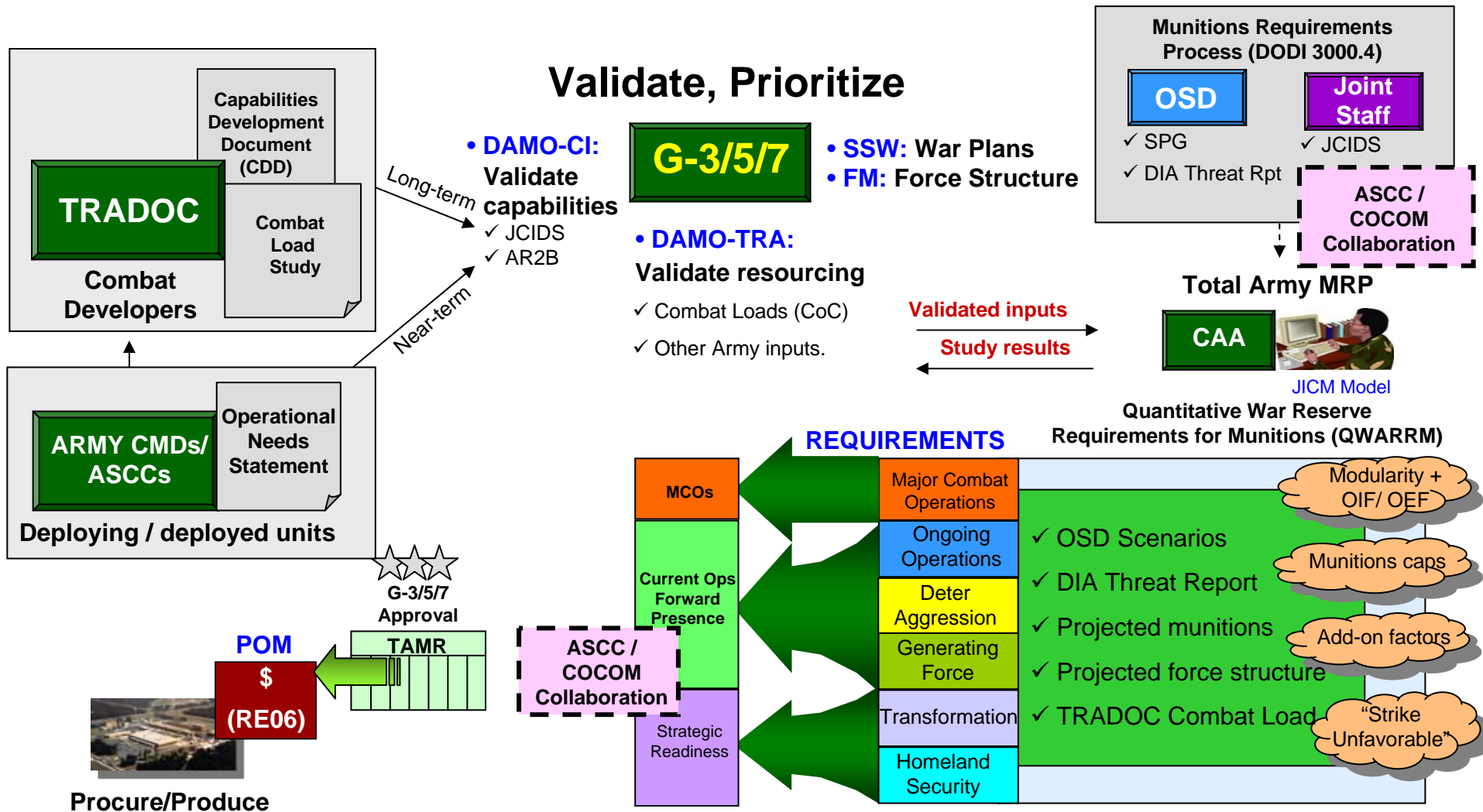


**ATACMS Unitary
(M57)**

- 500# Unitary Warhead
- 270 KM Range
- Vertical Attack capability
- GPS-aided Inertial Guidance



War Reserve Requirements Process





Summary - Requirements Characteristics

The Army's QWARRM process produces a Requirements Estimate that:

- Reflects the quantities of munitions the Army needs to successfully execute ground-based maneuver force Campaign Plans (versus achieving specific target attrition goals).
- Considers the objectives and munitions demand for each phase of the campaign plan.
- Is derived from detailed functional analysis of Division/BCT-level performance of opposing force weapons systems in an environment representative of the theater.
 - Uses approved shooter / munitions / target probability-of-kill data from AMSAA.
 - Reflects appropriate doctrine and tactics for employment of the weapons systems.
- Provides a comprehensive theater / scenario-specific, auditable estimate of munitions requirements throughout a campaign.



Validation of Campaign Results

- CAA's Campaign Analysis Review (munitions):
 - Rounds per Tube per Day
 - Inventory caps
 - Tonnage
 - Kills and hits
 - Phasing
 - Quantities Expended vs Carrying Capacity
 - Sequence of Expenditures
- Only after validation is complete are study results briefed to the Director, CAA, for release to the Army G-3 (DAMO-TRA).
- Army G-3 (DAMO-TRA) conducts Council of Colonels to further validate QWARRM outputs, leveraging input from "Team of Teams."
- Outputs approved by DA G-3 before release to OSD



QWARRM Summary

- The QWARRM process has evolved over time, as the Army and CAA have refined it to meet the demands of the munitions requirements process and the OSD MRP.
- CAA's OPLAN analysis support to ASCCs that are associated with major Defense Planning Scenarios significantly enhances the Army's ability to faithfully represent the ASCCs' intent during the campaign.
- The Army is confident that scenario based munitions requirements accurately reflect what the Army needs to successfully execute a specified theater campaign plan (vice the estimated munitions required to kill a specific number of targets).

Weapons Capability Portfolio



Chuck Kelly

OUSD(AT&L)

Land Warfare & Munitions

10 June 2008

**OUSD(AT&L)/A&T/PSA/LW&M
Room 5C756
3090 Defense Pentagon
Washington, DC 20301-3090**

**(703) 695-1772
DSN 225-1772
charles.kelly@osd.mil**

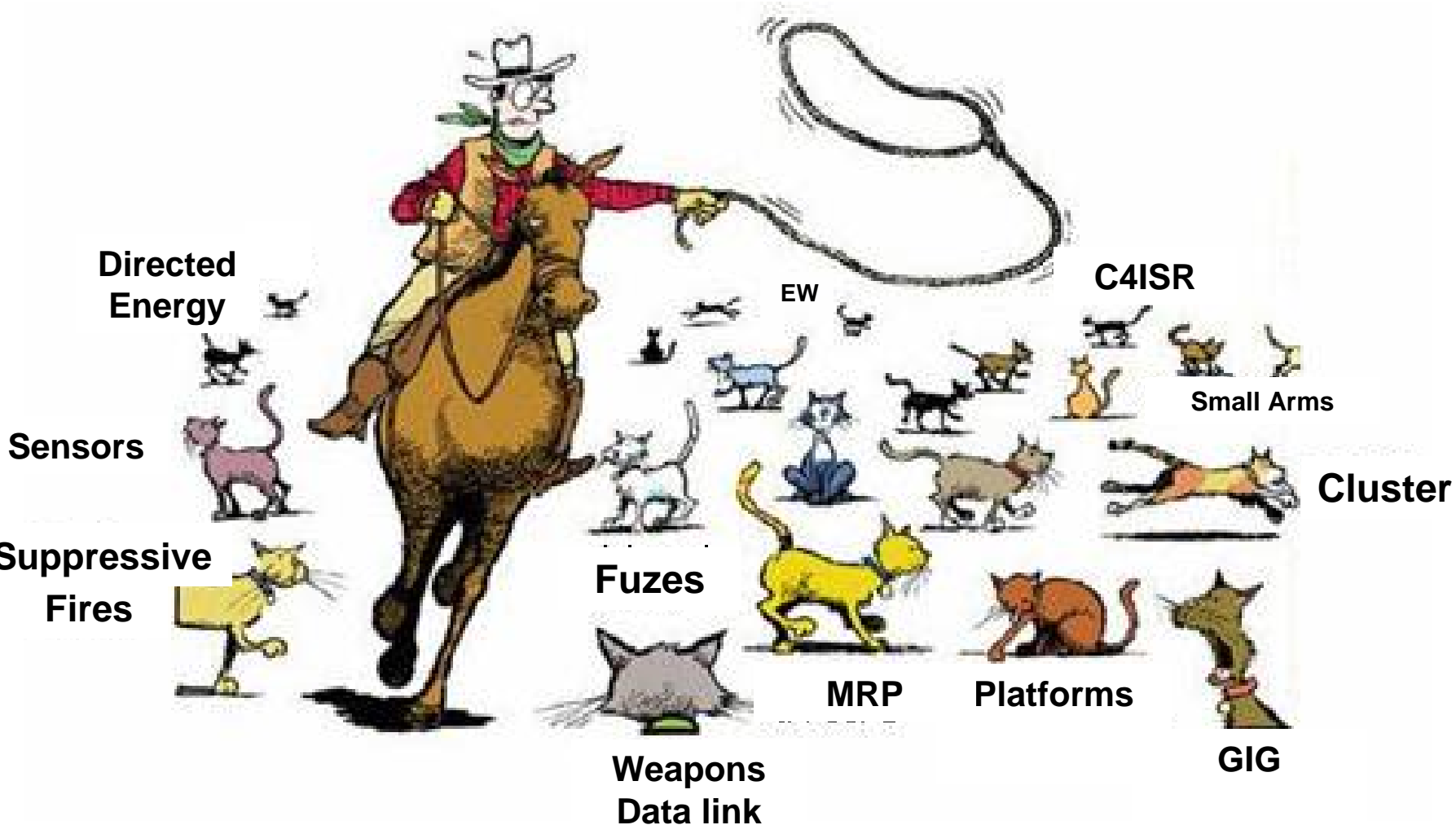


What's In the Portfolio?

- **Highly Precise Munitions**
- **Not so Precise Munitions**
- **“Volume Fire” Munitions**



Assessing the Portfolio





Agenda

- **AT&L Perspective**
- **Budget Trends**
- **Assessing the Portfolio**
 - Proficiency
 - Sufficiency
- **Road Ahead**



Secretary of Defense

Hon. Robert Gates



Deputy Secretary of Defense

Hon. Gordon England

Under Secretary of Defense for Acquisition, Technology & Logistics

Hon. John Young

Principal Deputy : Vacant



DUSD(Acquisition & Technology)

Hon. James Finley



Secretary of the Army

Hon. Pete Geren

Secretary of the Navy

Hon. Donald Winter

Secretary of the Air Force

Director, Portfolio Systems Acquisition

Mr. Dave Ahern



Land Warfare & Munitions

Mr. Tony Melita





USD (AT&L) Strategic Thrusts

Strategic Thrust 1 – Define Effective and Affordable Tools for the Joint Warfighter

Strategic Thrust 2 – Responsibly Spend Every Single Tax Dollar

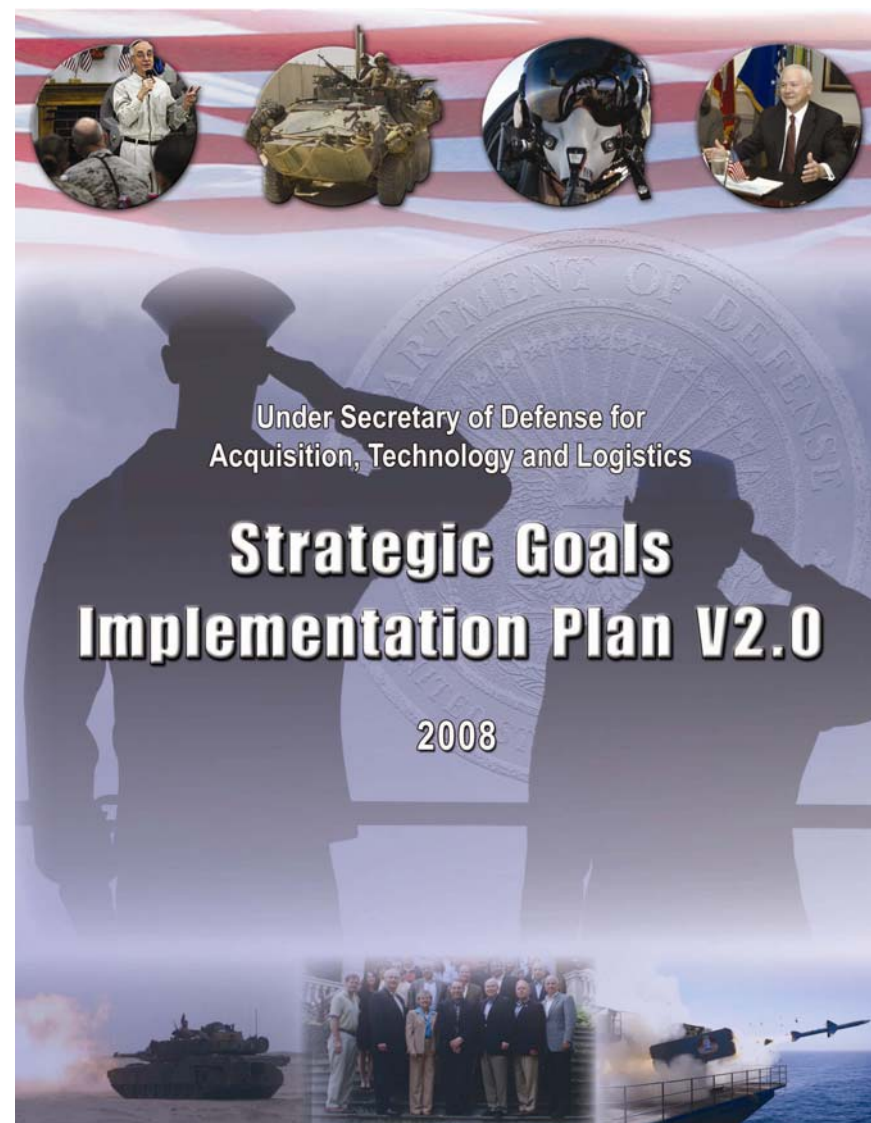
Strategic Thrust 3 – Take care of our people

Strategic Thrust 4 – DoD Transformation Priorities

Warfighter is #1 Focus – Need to Understand Operational Concepts & Needs to:

- Guide Technology
- Design Effective Systems
- Provide Logistics and Facility Support

<http://www.acq.osd.mil/goals/>





Strategic Thrust 1

- **Outcomes**

- New programs are born joint, interoperable, and affordable
- Opportunities are constantly identified to deliver greater enterprise efficiencies
- **Roadmaps guide development and integration of programs in portfolio areas**
- Cost to the Defense Enterprise is continuously reduced



Strategic Thrust 1 Roadmap Metrics

- **Initiate a Joint Weapons JAT and develop Joint Weapons Roadmap Version 1.0 focused on weapons capability investment strategies beyond POM10.**
- **Initiate an Electronic Warfare JAT ... focus coordinating EW investment options for POM 10.**
- **Initiate Directed Energy JAT and deliver Roadmap Version 1.0.**

Budget Trends

Figure 1-1 Updated

Past and Projected Funding for Defense

(Billions of 2008 Dollars of Total Obligational Authority)

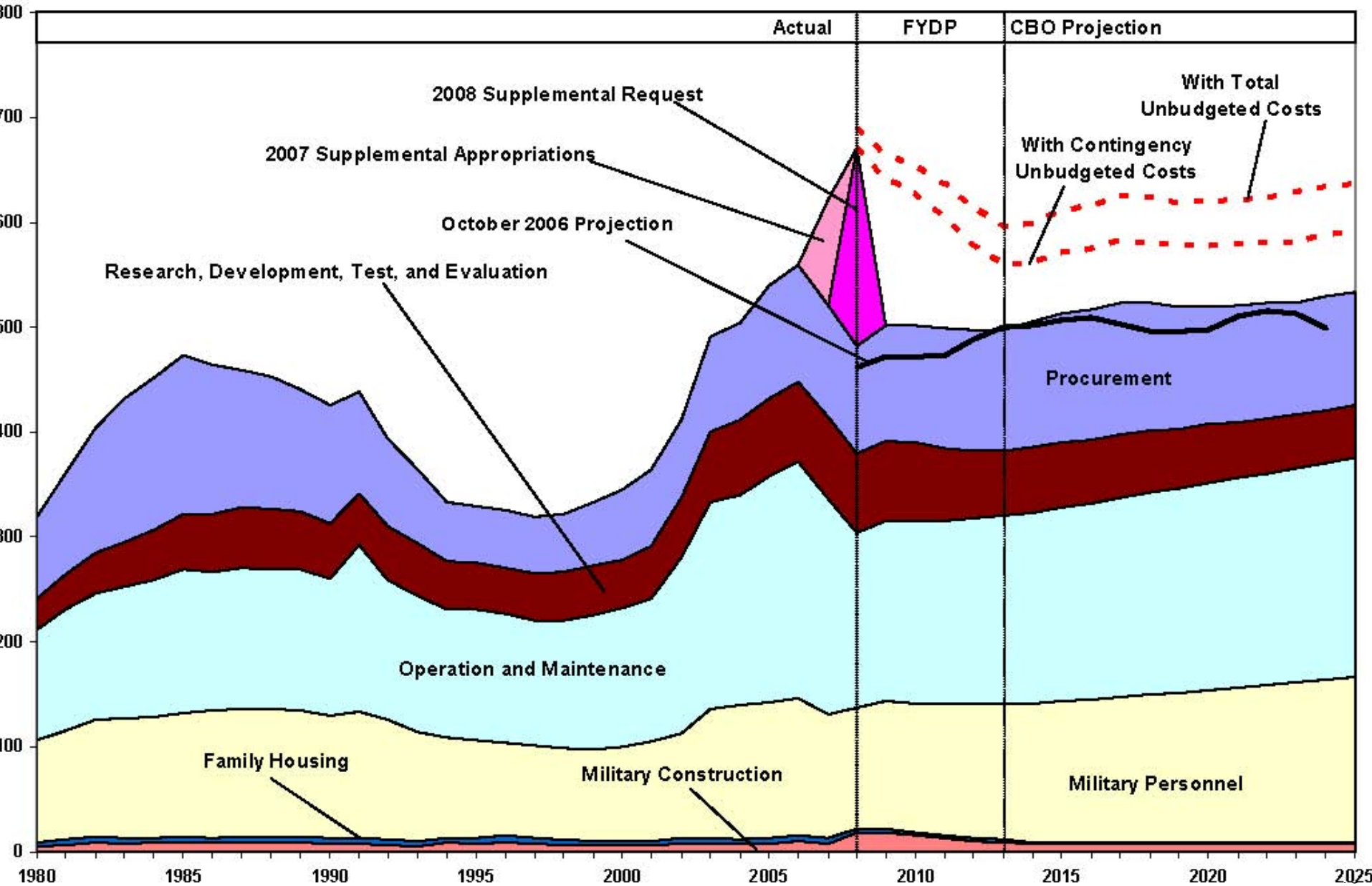
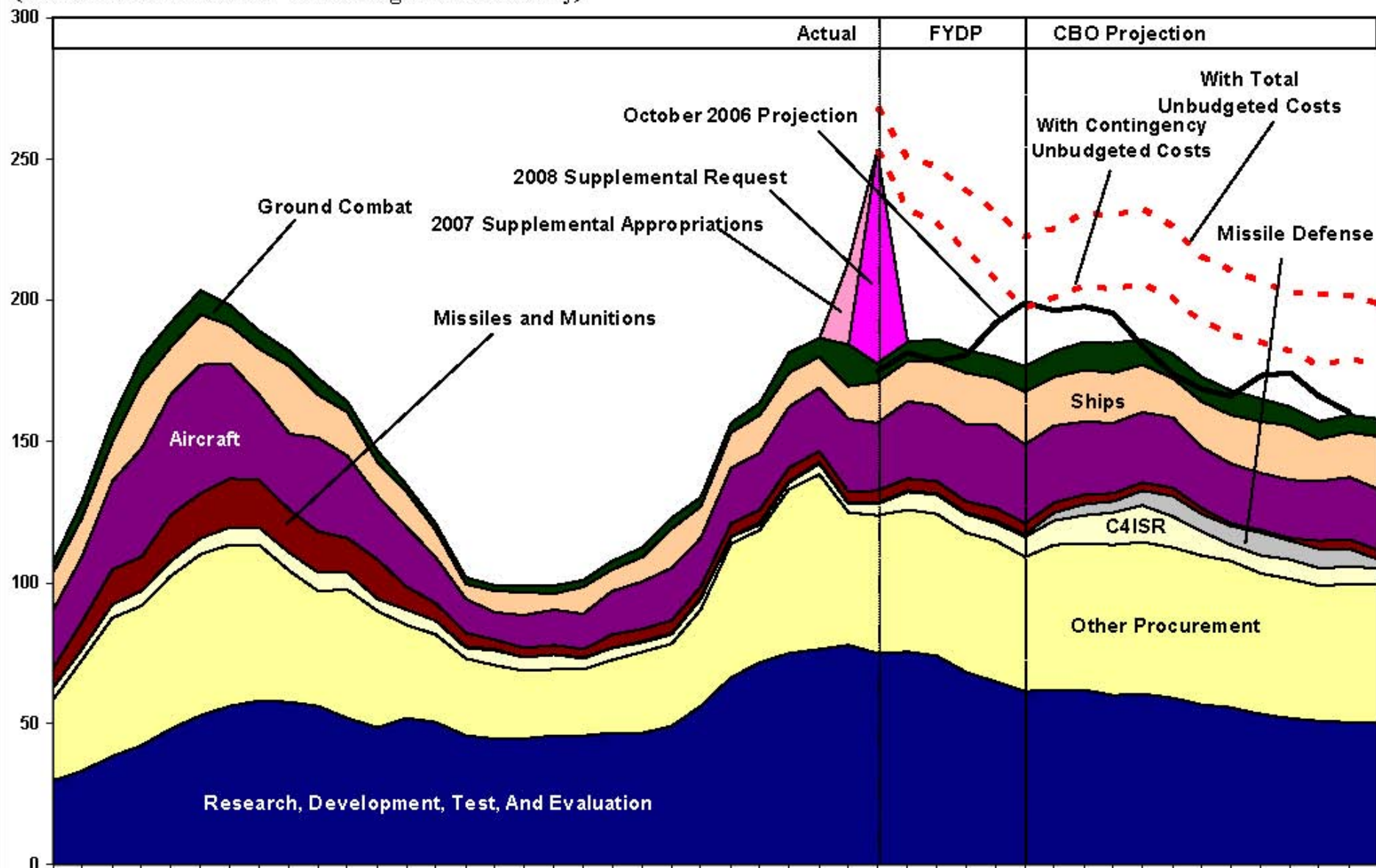


Figure 3-1 Updated

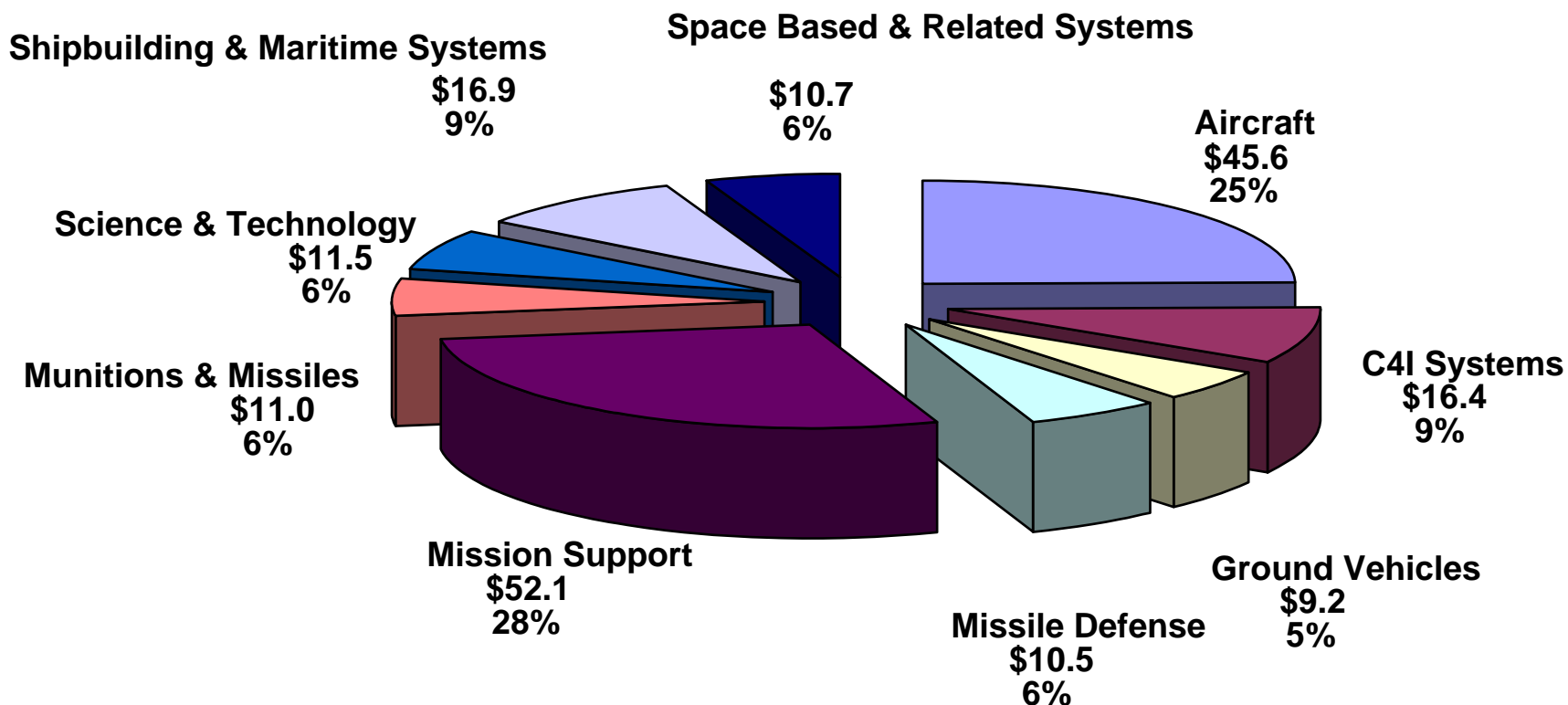
Funding for Investment, by Budget Account and Weapon Type

(Billions of 2008 Dollars of Total Obligational Authority)



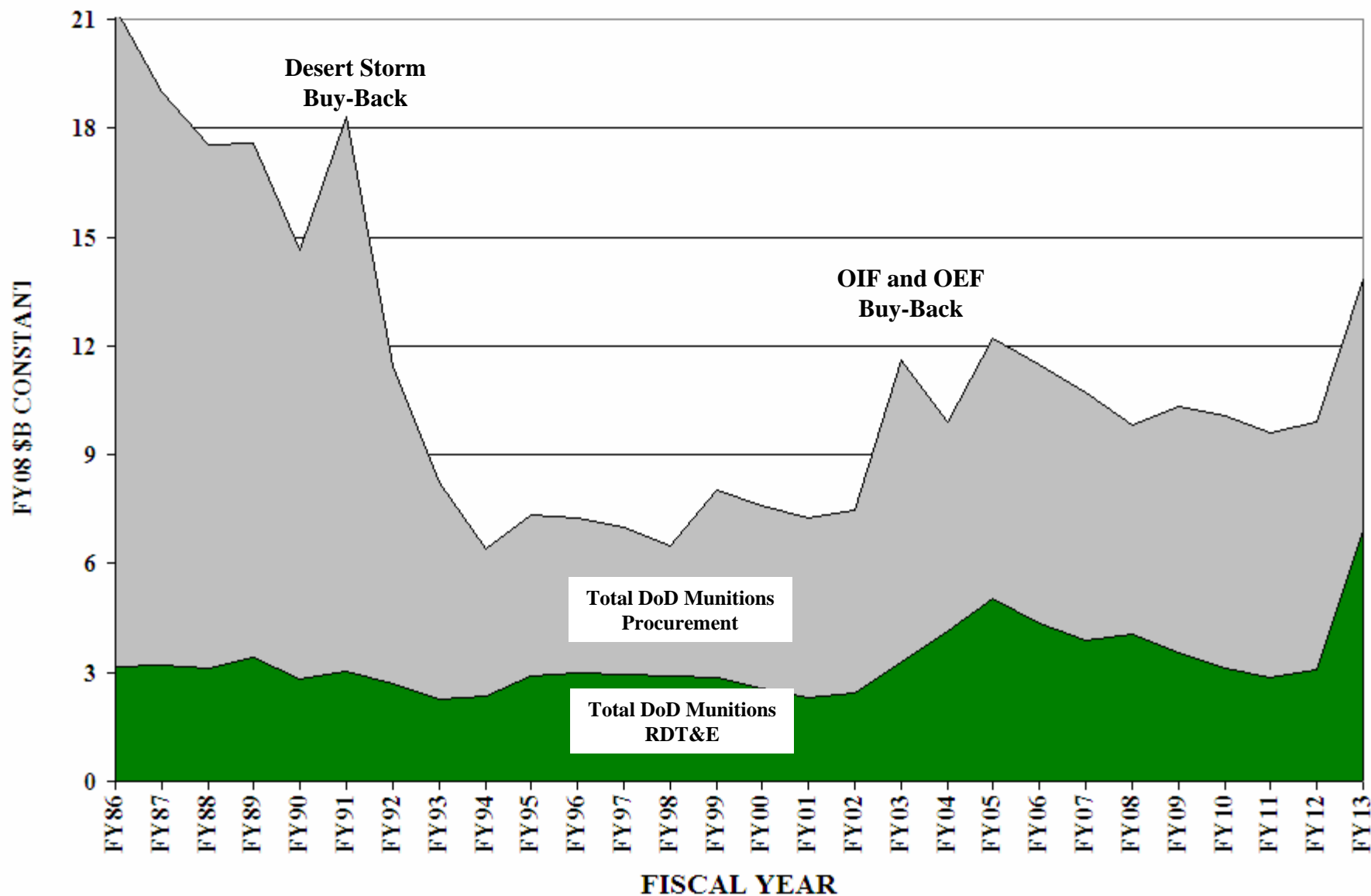


FY 2009 Strategic Modernization Breakdown

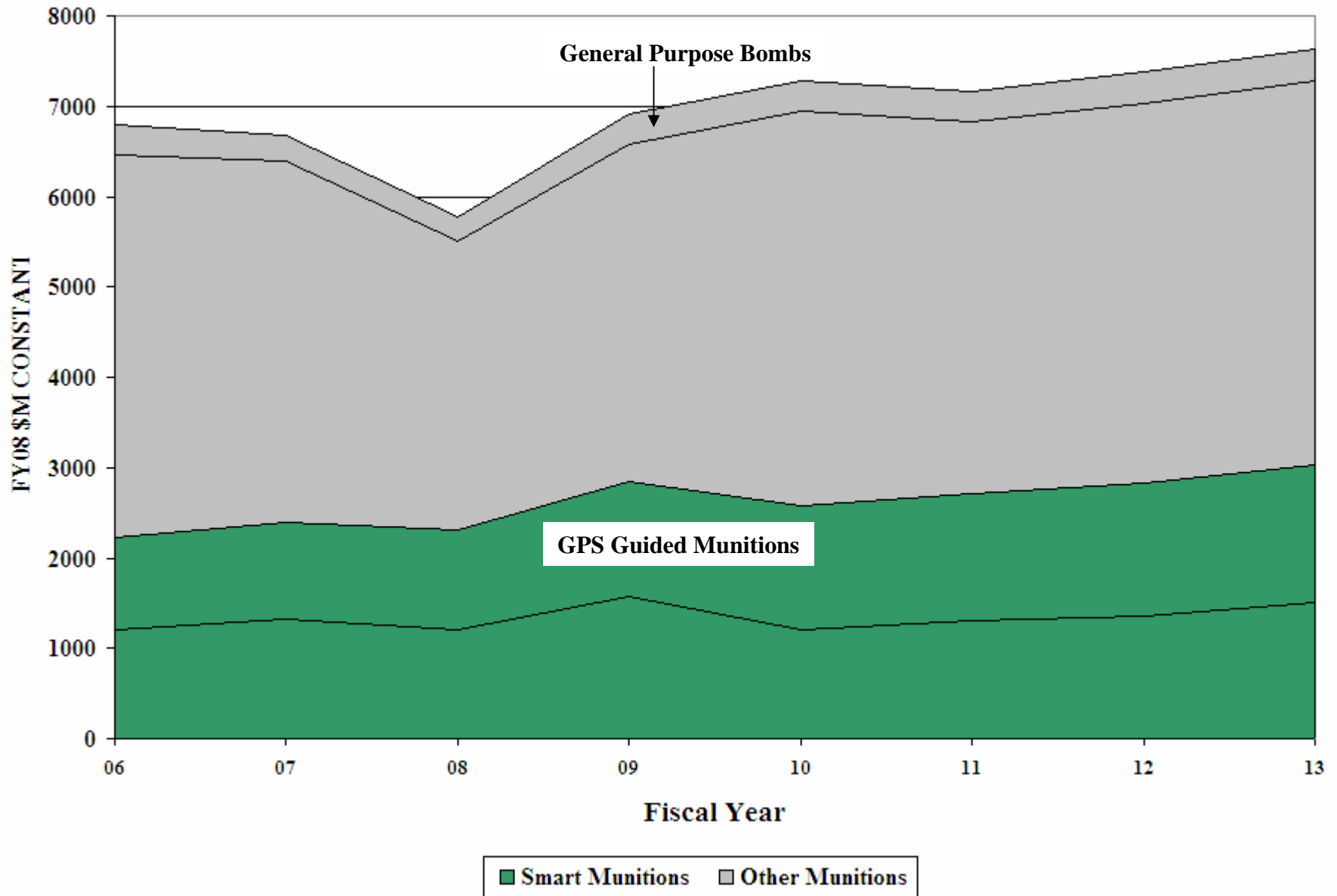


Total Budget \$183.8B

DoD Munitions RDT&E and Procurement



Smart Munitions vs. Other Munitions Procurement Trend





Move to Precision

- **AIR**

- Dumb bombs to smart bombs
- Unguided rockets to guided rockets
- Single mode seekers to multi-mode seekers



- **Ground**

- Ballistic artillery to guided artillery
- Unguided rockets to guided rockets
- Precision mortars



- **Maritime**

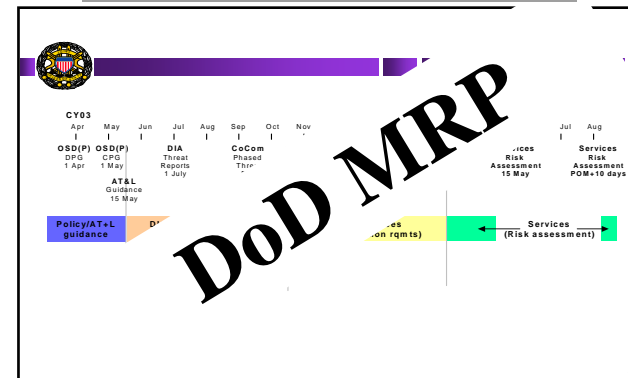
- Unguided surface fires to guided fires



What / How Much Do We Buy?



Sufficiency



“HOW MUCH OF EACH DO WE BUY?”

PPBES

3000.4

Threat Based

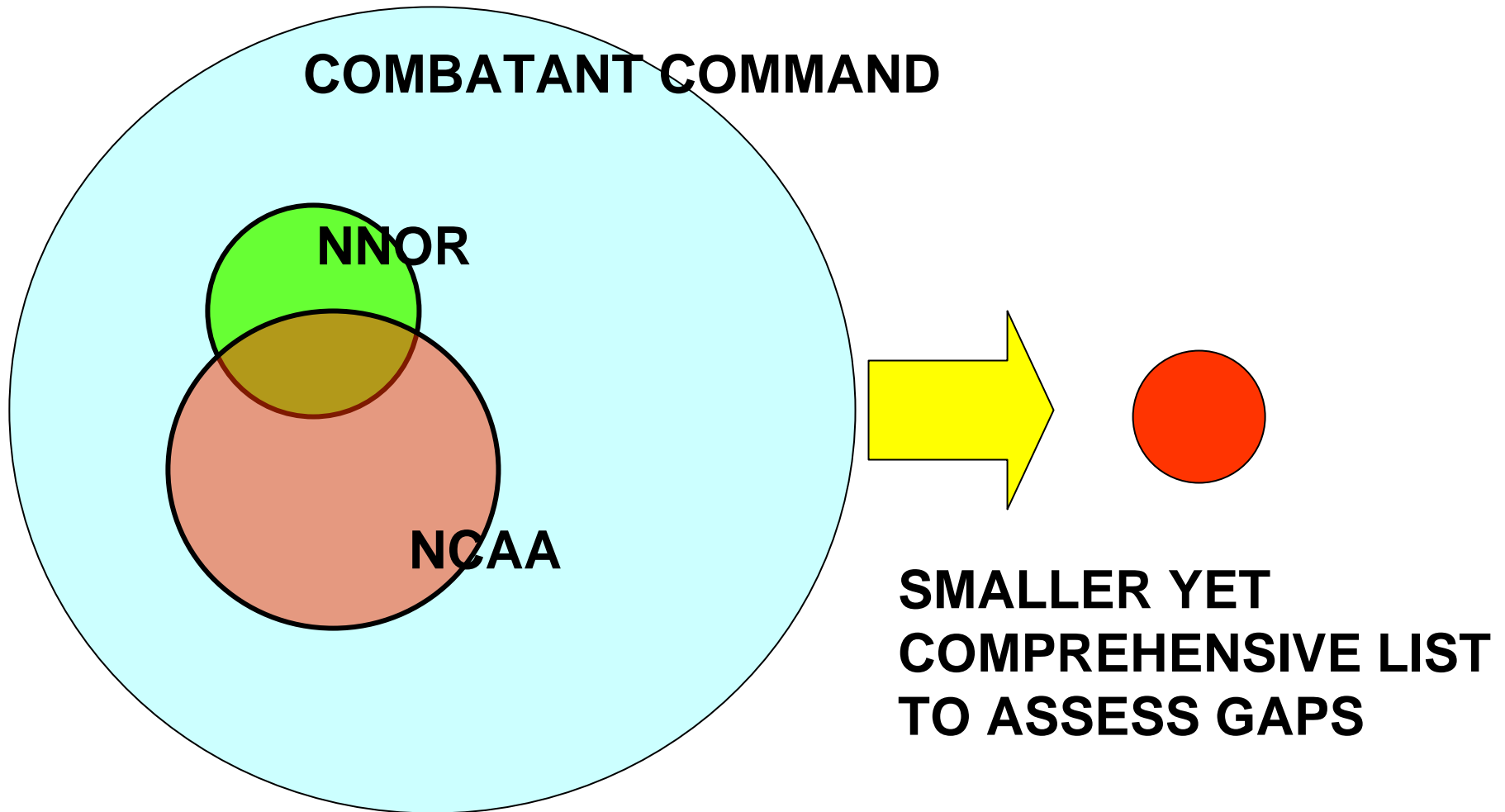


Proficiency Factors

- **Targets Effects Desired**
- **Threat Environment**
- **Domain Requirements**
- **Target Environment**



Identify Targets

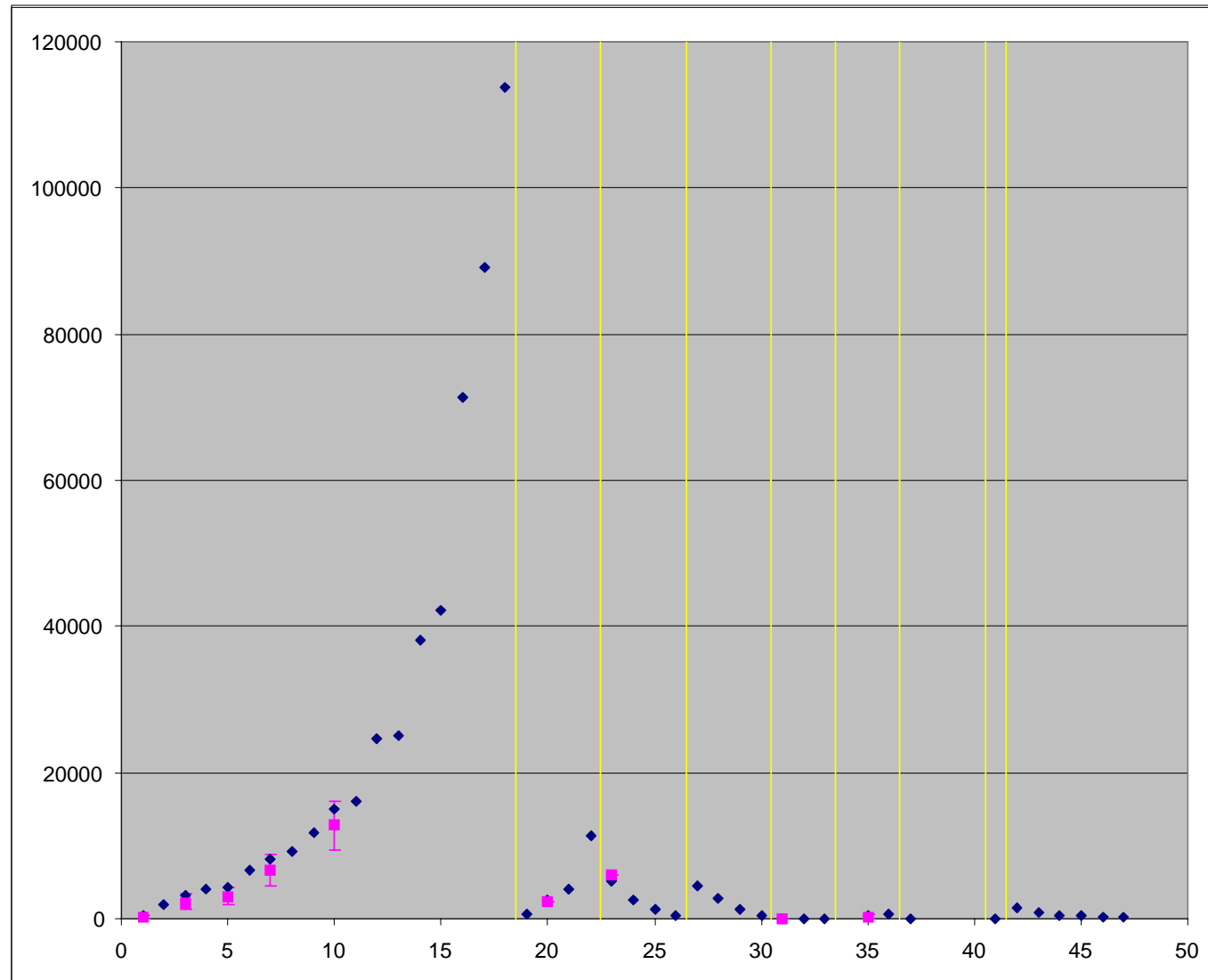




Traditional Target Vulnerabilities

Desired Effects:

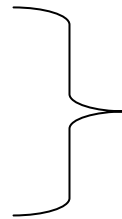
- Blast
- Frag
- Crater
- Structure





Non-Traditional Target Effects

- Non-Kinetic – I/O & EW
- Non-Lethal

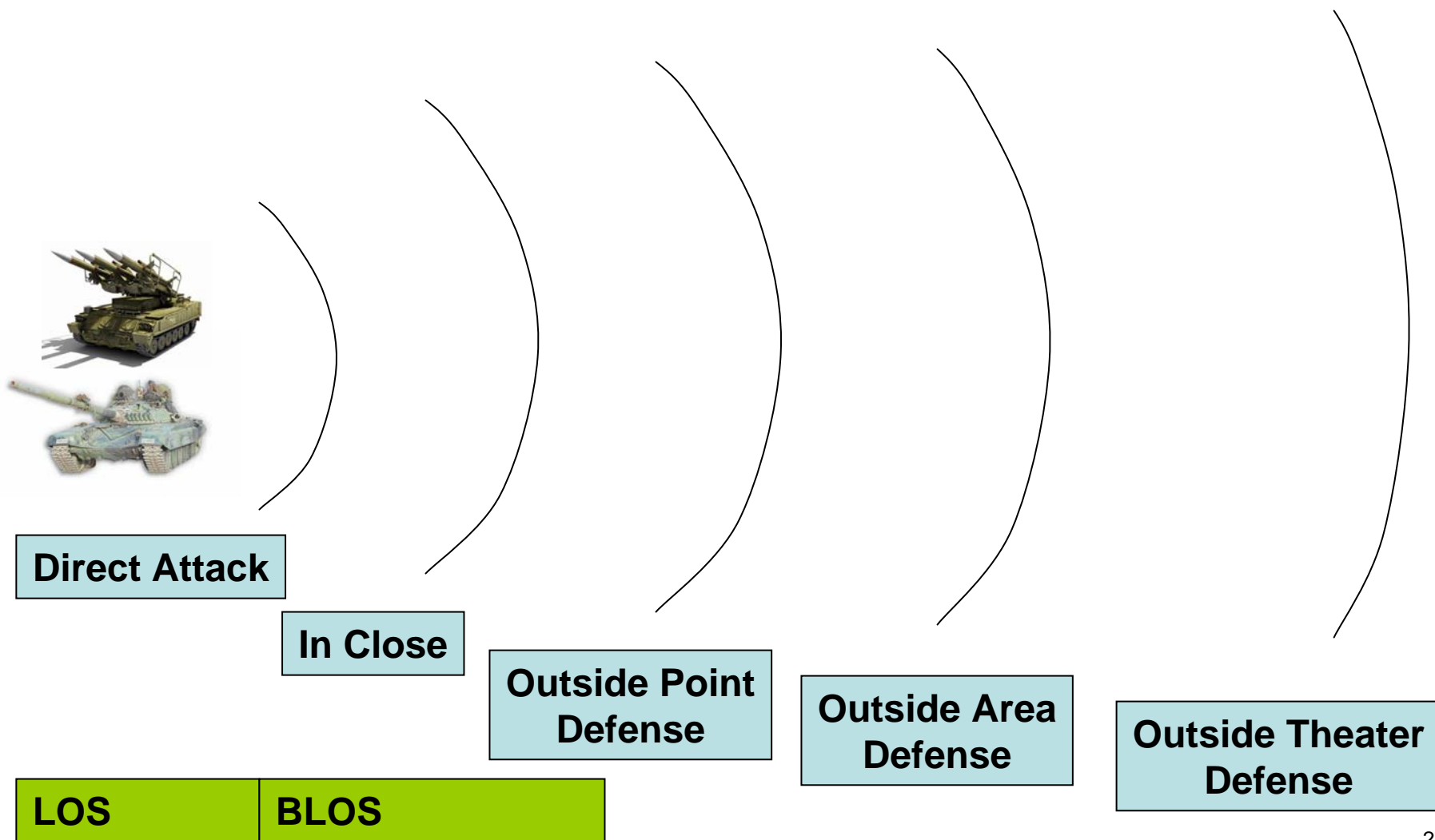


**Layered Capabilities
&
Confidence Factor?**

CP Tasks	CM Tasks
<ul style="list-style-type: none">• Deny Access Into/Out of an Area to Individuals• Move Individuals Through an Area• Disable Individuals• Suppress Individuals	<ul style="list-style-type: none">• Stop Vehicle• Disable Vehicle• Stop Vessel• Disable Vessel• Stop Fixed-Wing Aircraft on the Ground• Disable Aircraft on the Ground• Divert Aircraft in the Air• Deny Access to Facility



Threat Environment





Domain Requirements

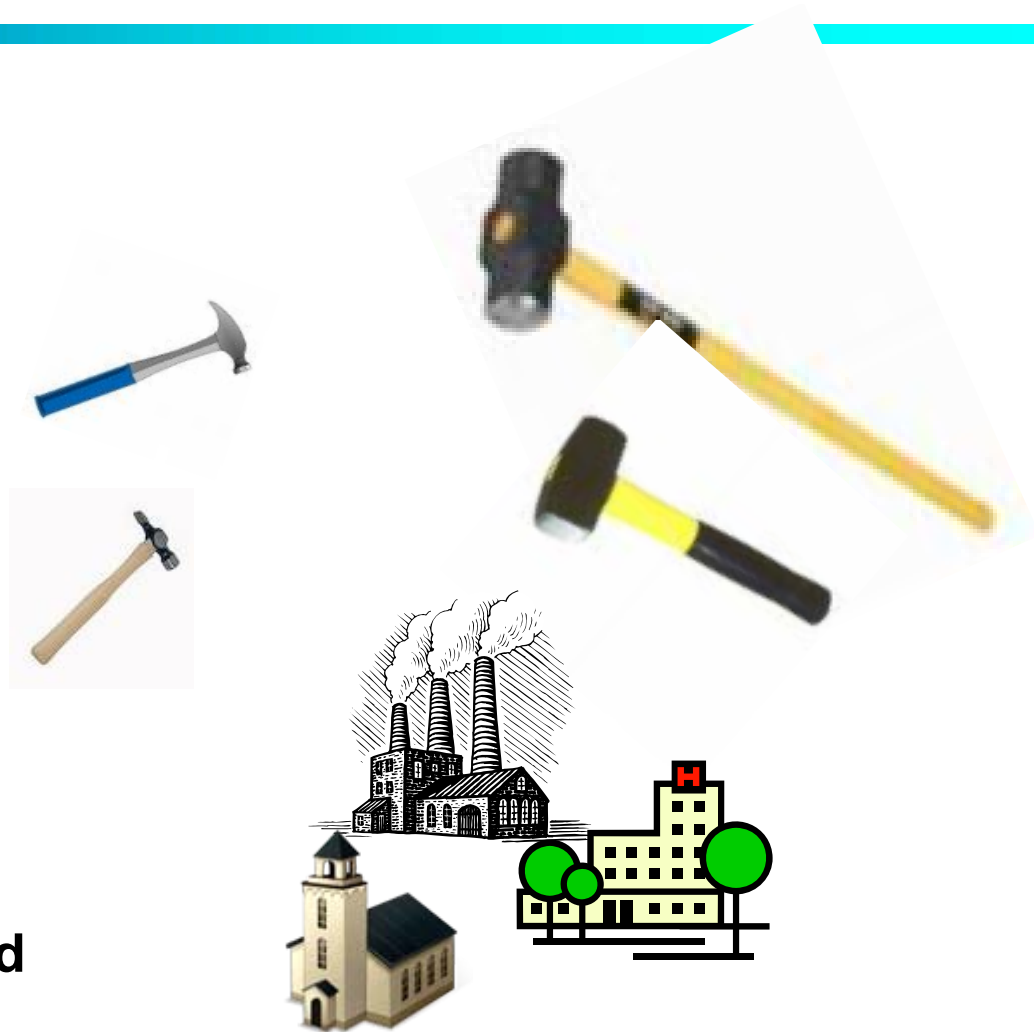
- **Air**
 - Bomber
 - TacAir
 - Helo
- **Ground**
 - Direct Fire
 - Indirect Fire
- **Maritime**
 - Surface
 - Subsurface
- **Cyber??**

Overlap vs. Redundancy



Target Environment

- Enemies
- Friendlies
- Non Combatants
- Infrastructure
 - Power
 - Water
 - Transportation
 - Hospitals
- Effects – Desired / Undesired





Target Environment



SDB-FLM



MK-82-FLM



Low Collateral
&
MK-82



Practice
Bombs

=

**Dial
A
Yield**

How Do We Capture Needs / Desires?

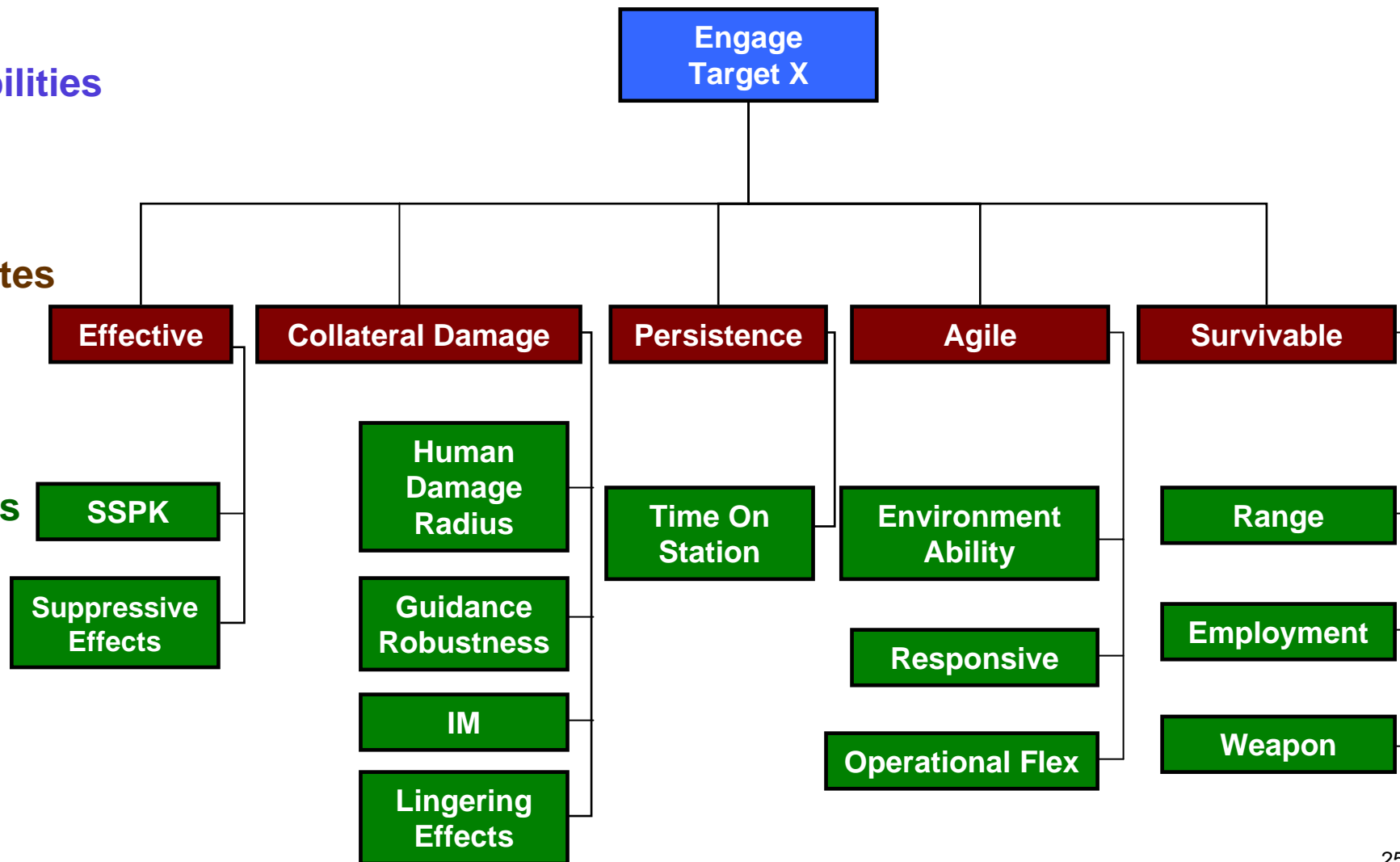


Weapon Attributes

Capabilities

Attributes

Metrics





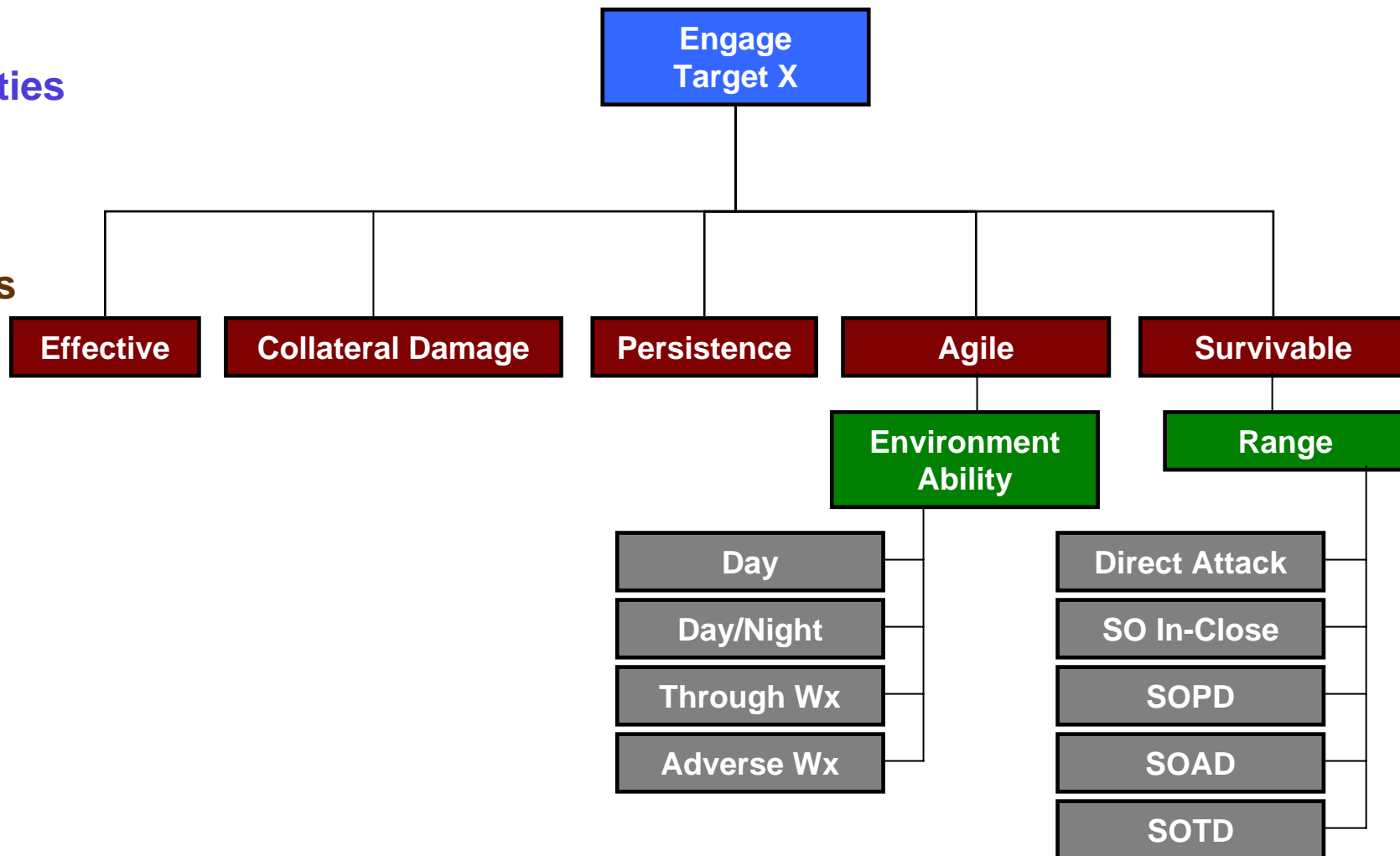
Measures of Effectiveness

Capabilities

Attributes

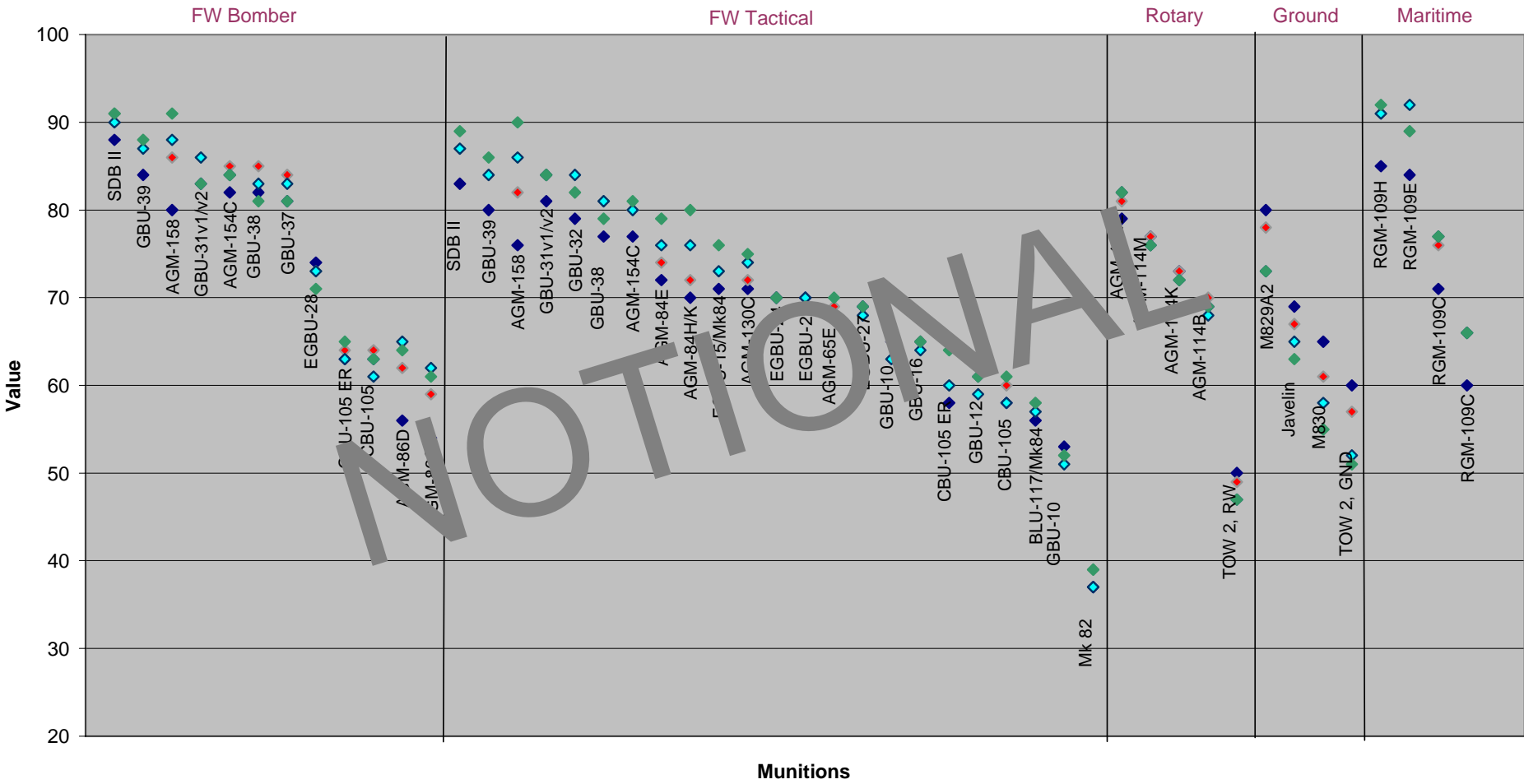
Metrics

MOEs



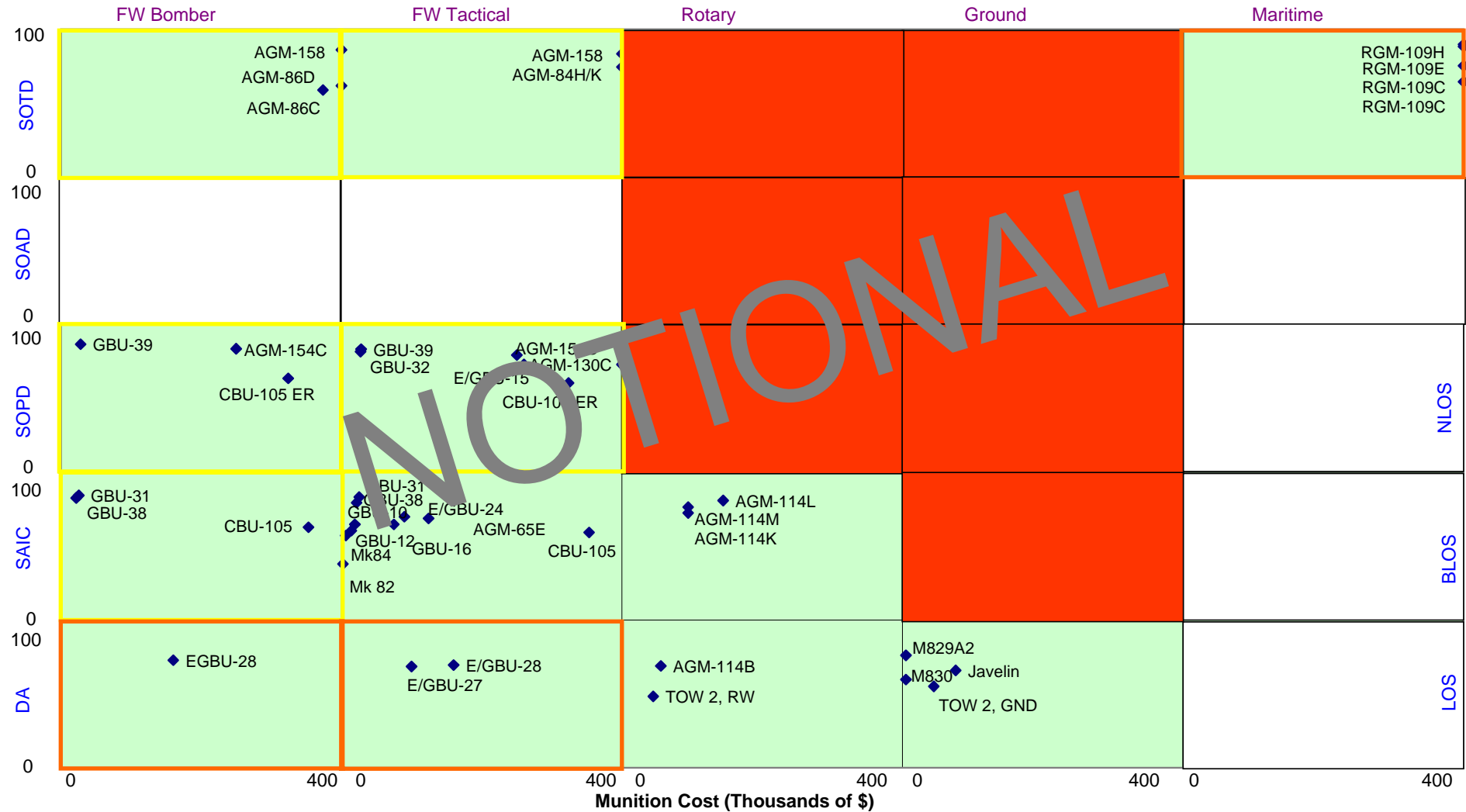


Domains



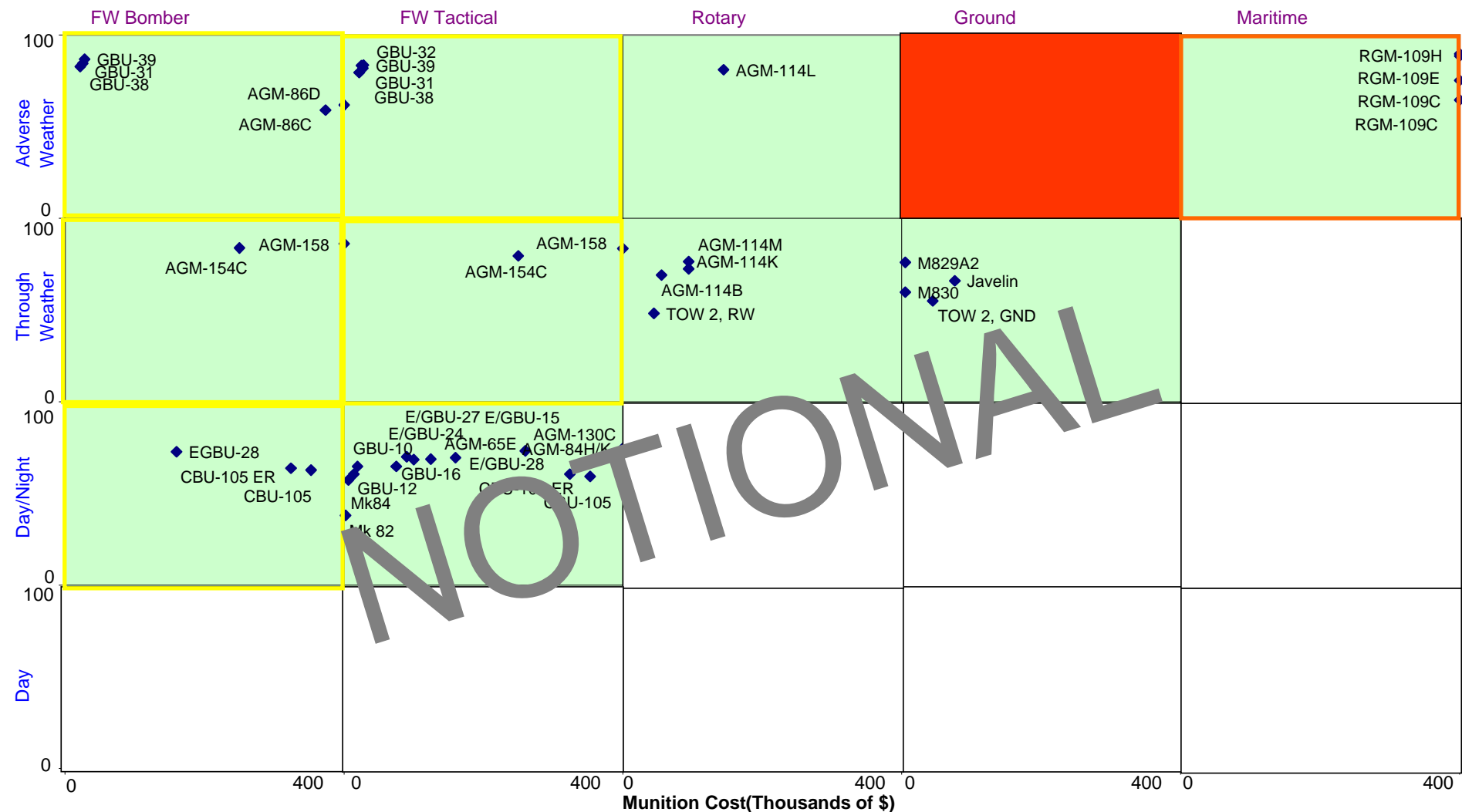


Capability - Range





Capability - Environment



Sufficiency



DoD Munitions Requirements Process

Threat Report

DIA

Maneuver Forces
Air
Maritime
IADS
Infrastructure
Strategic

**CoCOM
J8 WAD**

Phased Threat Distribution

Allies

SOCOM

USMC (Air & Ground)

USA

USN

USAF

Phase I: $w\%$

Phase II: $x\%$

Phase III: $y\%$

Phase IV: $z\%$

Total Munitions Requirement

- Combat Requirement
- Strategic Readiness Requirement
- Current Operations/Forward Presence Requirement
- Test & Training Requirement

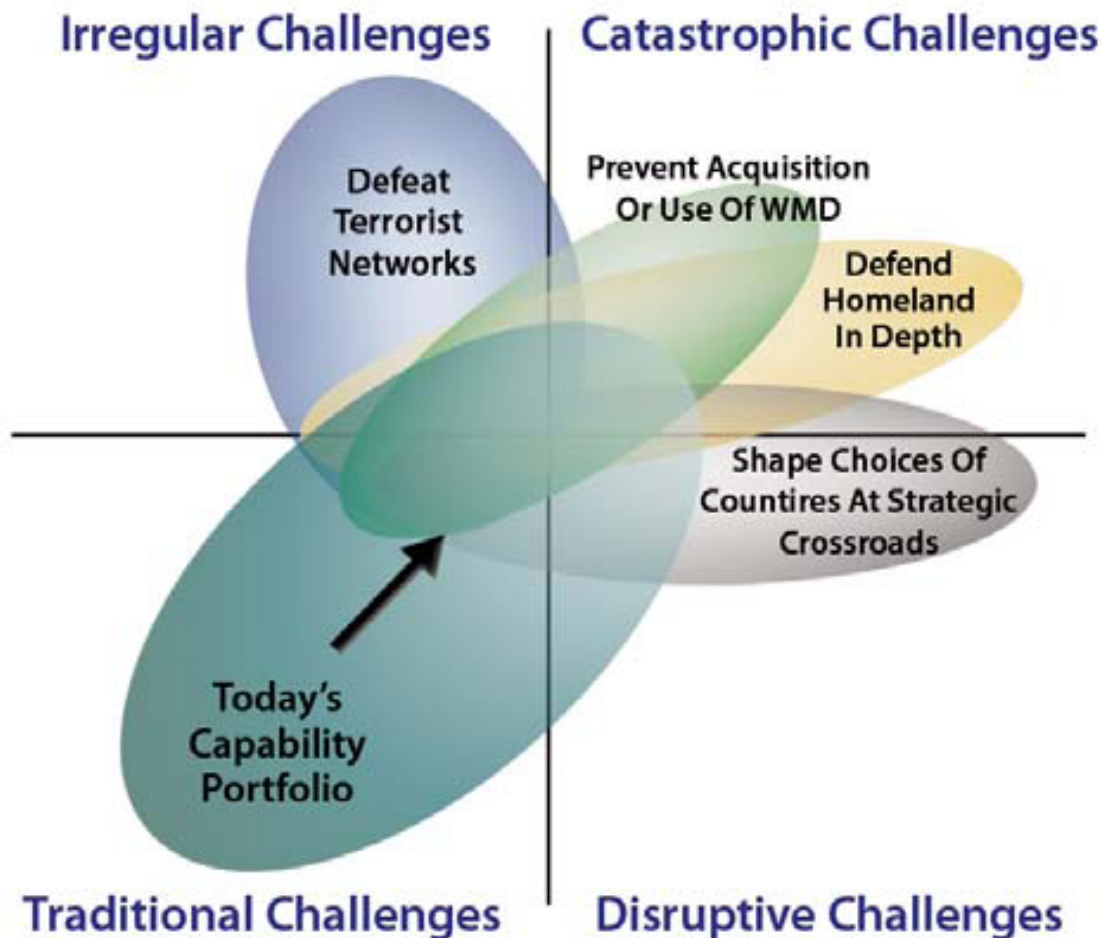
Service Processes

NNOR
NCAA
QWARRM

Services



Operationalizing the Strategy – 2006 QDR





Force Planning Construct – 2006 QDR

Steady State

Surge





Danger





Road Ahead – The Challenges

- **Build & Update Roadmaps**
 - Weapons
 - Directed Energy
 - Electronic Warfare
 - Non Lethal Weapons
- **Improve Munitions Requirements Process**
 - Incorporate Increased Transparency, Visibility, and Collaboration into DoD Instruction 3000.4 (MRP)
 - Ensure Credible Guidance (Policy and Joint Staff Collaboration)
- **Maintain Visibility into Munitions Budgets**
 - Address Priority Capabilities
 - Identify Gaps
 - Identify Redundancies
 - Address Capability “Balance” (Across Sensors, Platforms, & Munitions)



Questions?



Hard Target Fuzing Challenges

Need to address HT related M&S, material properties, & testing

Issues:

- Harder Targets
- Weapon Response & Survivability
- Material Properties
 - Filler & Explosives



Fuze Well from
Characterization Tests





Need for MRP

- Provides the foundation for credible Service inventory numbers.
 - Near Year requirement provides sanity check for stockpile positioning
 - Out Year requirement “sets the bar” for inventory build
 - Requirement is the driver for weapon purchases in FYDP
 - Requirement is the driver for establishing new weapon system acquisition programs
- Ensures the equities of all participants are addressed, i.e. CoCOMs, Joint Staff, Services, and OSD.
- Prevents multiple requirements from being generated, i.e. a separate CoCOM and Service munitions requirement (ensures BOTH requirements will be discredited).

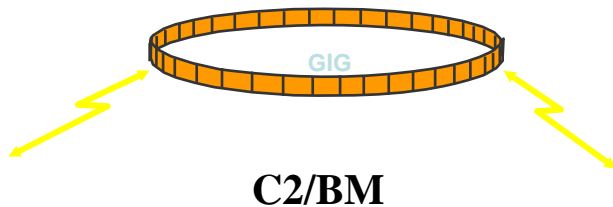


FA Assessment—Scoping

- No Joint Fires⇒ Engagement - Kinetic – Lethal – **EFFECTS**

- Integrated Systems - Required
 - F2T2EA Chain

Need all 3 to engage—
Following assessment is
scoped to weapon only



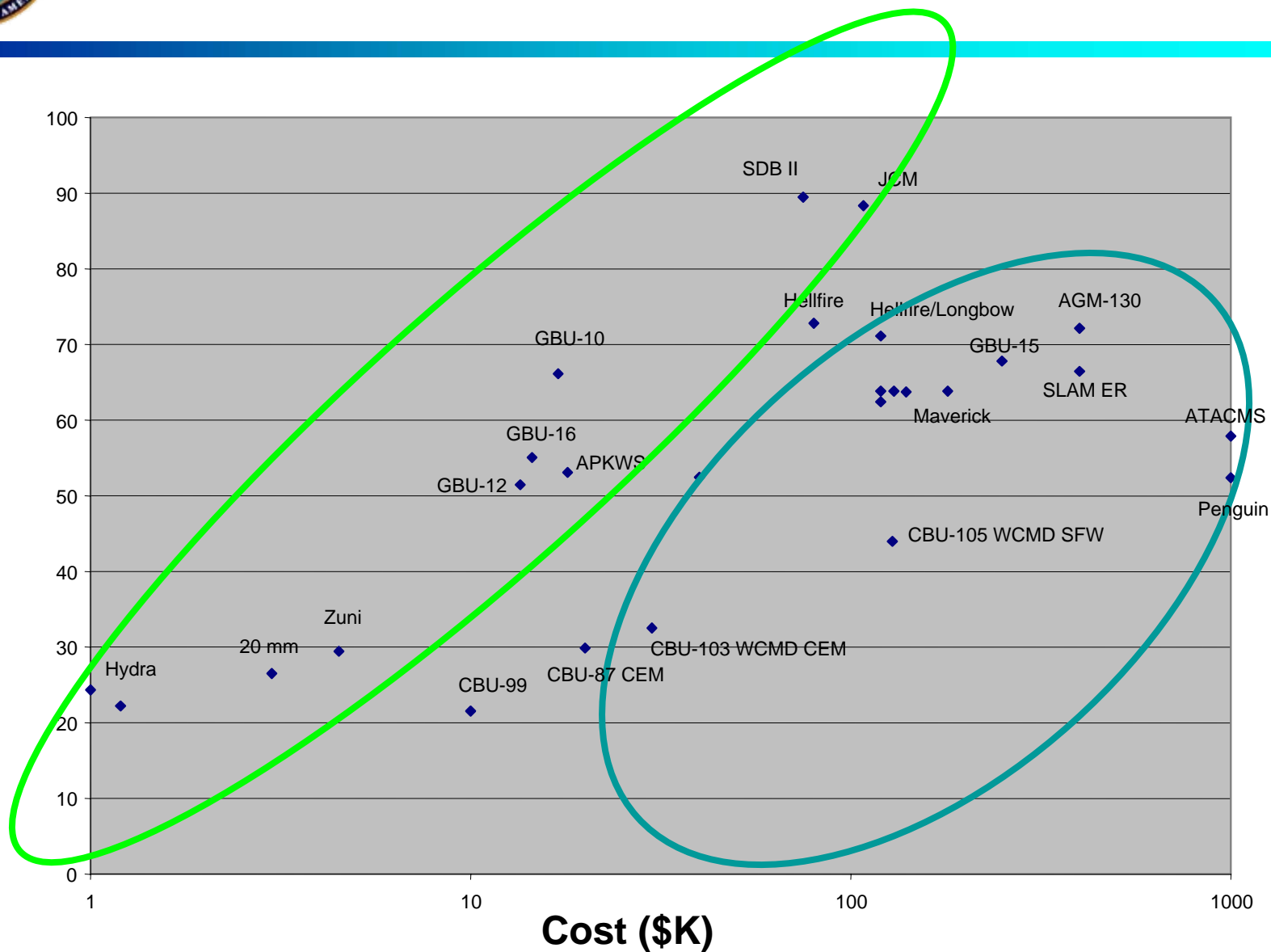
SENSORS



WEAPONS



Cost-Benefit Analysis

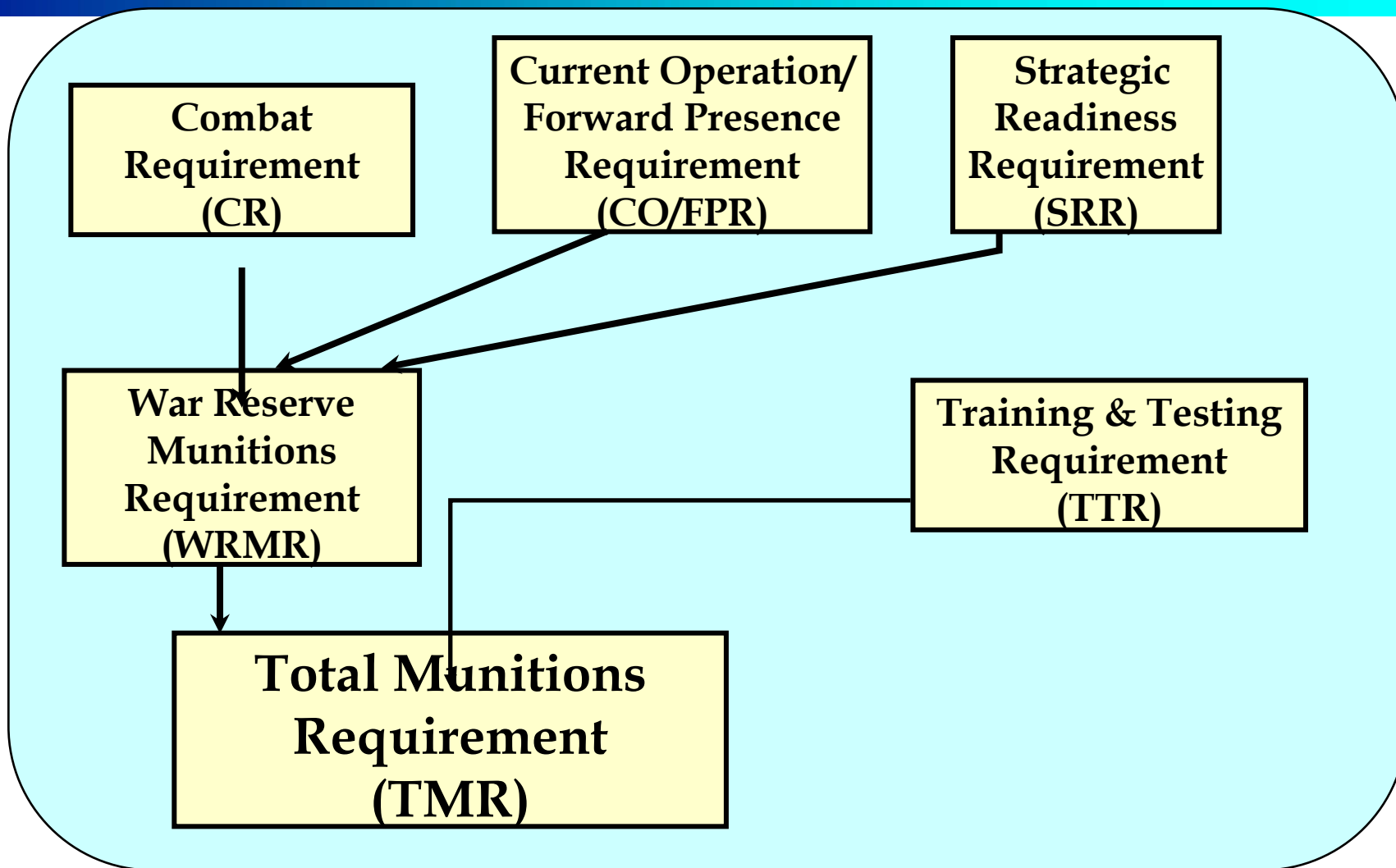




Questions/Comments????



DoD MRP Products





Terminology - Force Application Attributes

Effective – Able to precisely generate desired effects through a variety of kinetic and non-kinetic means in all environments.

Discriminating – Able to limit collateral damage and second order consequences of engagement.

Agile – Able to rapidly maneuver forces throughout all domains of the battlespace in all environments.

Survivability – Able to effectively maneuver and engage in a dynamic and uncertain threat environment.

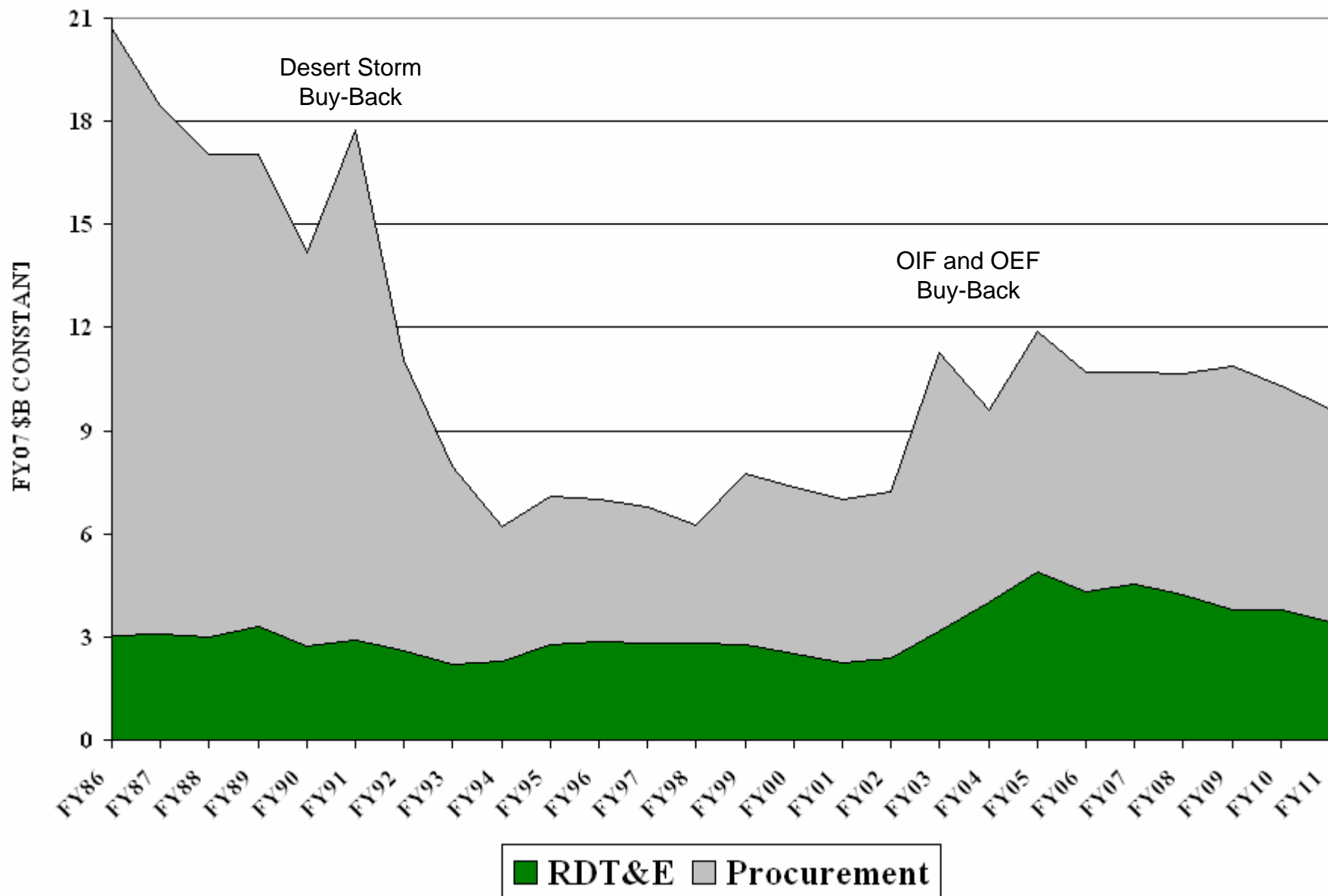
Persistent – Able to apply the necessary force continuously and sustain those operations as required to meet mission objectives.



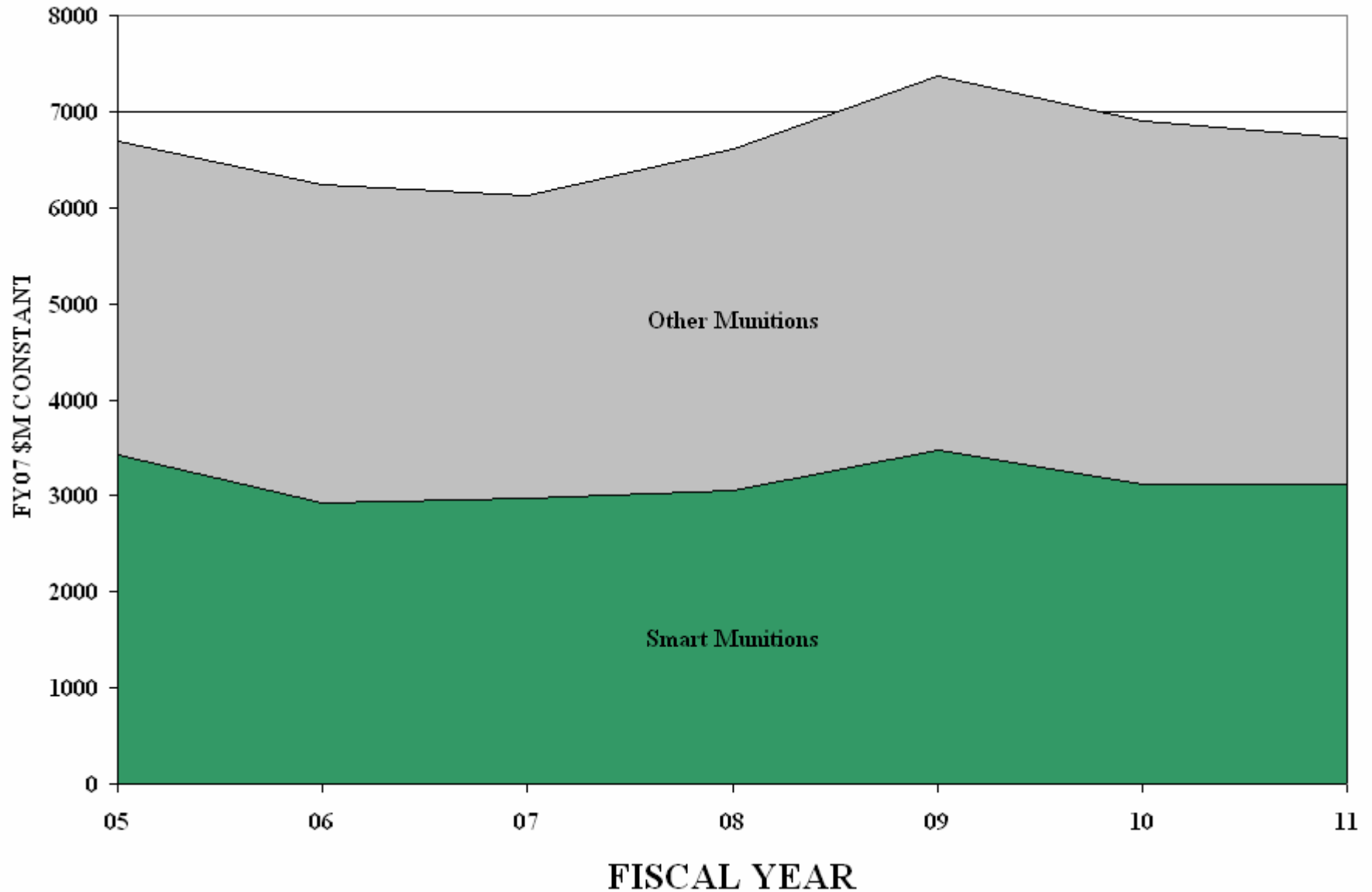
Terminology - Mission Context

- Fires in Support of Forces In Contact
- Fires to Enable Freedom of Ground Maneuver
- Fires to Enable Freedom of Air Maneuver
- Offensive Fires (Fires Independent of Maneuver/Contact)

DoD Munitions RDT&E and Procurement

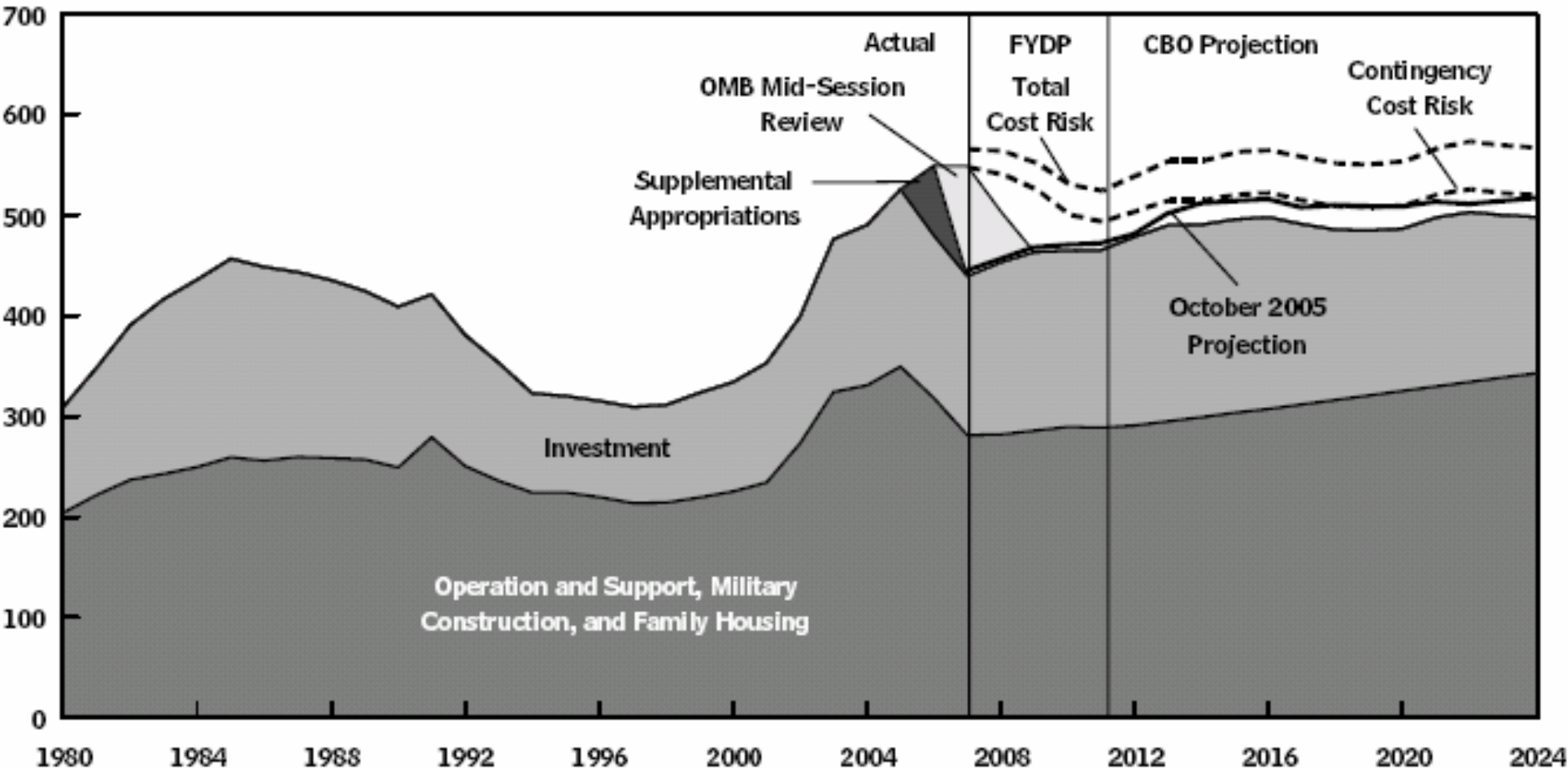


Smart Munitions vs. Other Munitions Procurement Trend



Past and Projected Resources for Defense

(Billions of 2007 dollars)

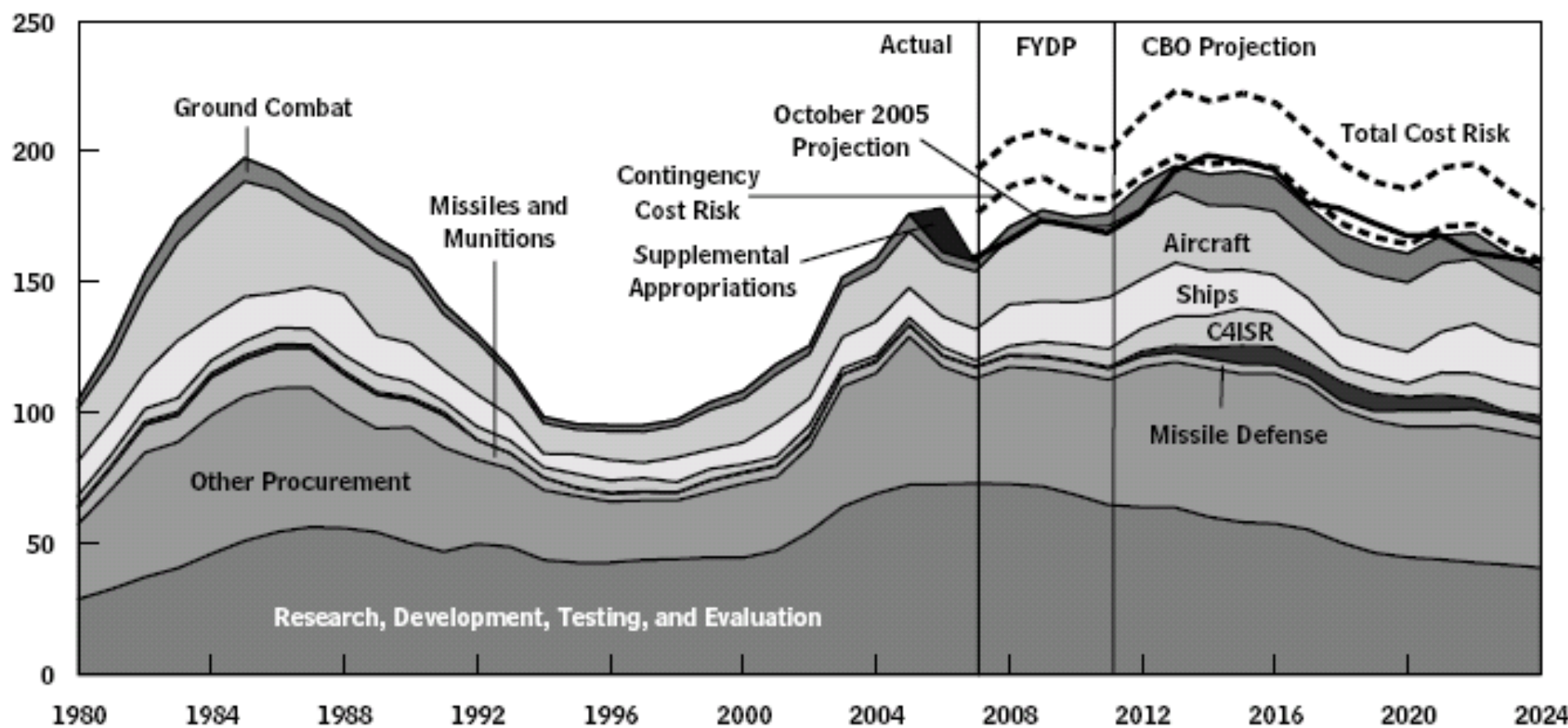


Source: Congressional Budget Office.

Note: FYDP = Future Years Defense Program; OMB = Office of Management and Budget.

Past and Projected Resources for Investment

(Billions of 2007 dollars)



Source: Congressional Budget Office.

Note: FYDP = Future Years Defense Program; C4ISR = command, control, communications, computers, intelligence, surveillance, and reconnaissance.





Missiles and Rockets Overview

***NDIA Armaments Technology
Fire Power Forum***

11 Jun 2008

***Robert Kirby
Division Chief, Advanced Systems and Requirements
Precision Fires Rocket and Missile Systems
Phone (256) 876-8791 (DSN 746)
Email: robert.kirby@us.army.mil***

***Recipients of the 2008
William J. Perry Award***



Topics



- Precision Fires products and performance
- Rocket and missile industrial base
- Contemplated capabilities
- GMLRS with Self Destruct Fuze

Any Warfighter - Anywhere - All The Time



PFRMS Systems at War



- All systems are supporting the Global War on Terrorism
- Currently supporting Operation Iraqi Freedom and Operation Enduring Freedom
- Performance is above Army Standards
- Launchers returning in excellent condition requiring only routine & minimal maintenance



M270A1
98% Readiness Rate

HIMARS
99% Readiness Rate

GMLRS Unitary
747 Rockets Fired
98% Reliability

ATACMS
537 Missiles Fired
98% Reliability



[Play Video 1](#)

[Play Video 2](#)

Any Warfighter - Anywhere - All The Time



GMLRS with Bulova Self Destruct Fuze

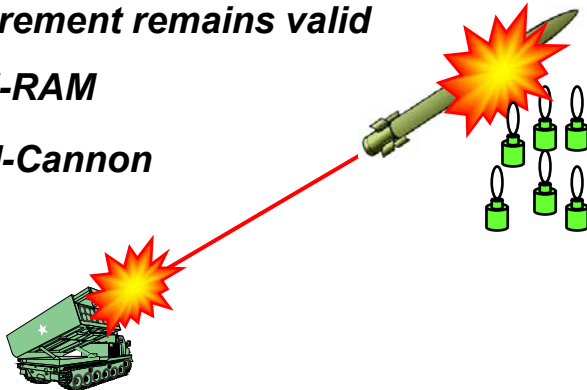


Q: SDF needed by the user?

A: Requirement remains valid

✓ TCM-RAM

✓ TCM-Cannon



GMLRS

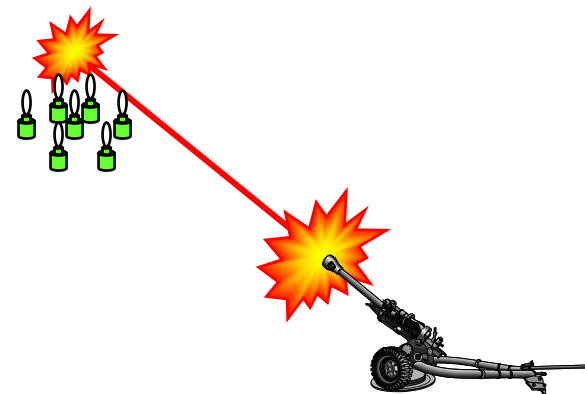
- Less than 1% hazardous duds

Assumptions:

- No degradation of primary mode (95% reliability)
- SD mode operates as well as in artillery (95% reliability)

XM864

- 97% Primary Mode Reliability
- 95% Self Destruct Mode Reliability
- 99.85% Overall Fuze Reliability



Any Warfighter - Anywhere - All The Time



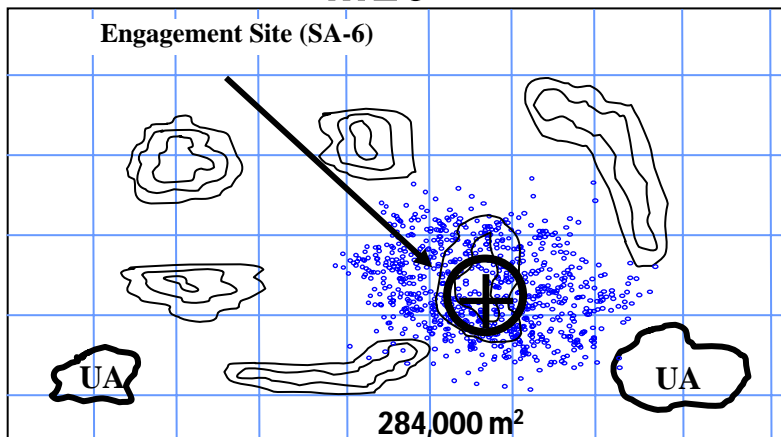
SDF Update:

GMLRS DPICM w/SDF Reduced UXO Engagement Example



Comparison Of M26 And GMLRS M30 DPICM w/SDF Engaging SAM Missile Site

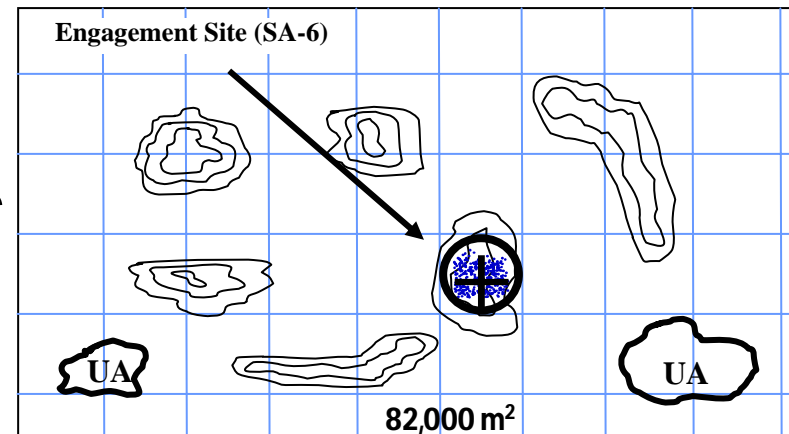
M26



- 75 Rockets Required To Destroy Target
- 644 Grenades Per Rocket
- At 5% Dud Rate, Over 2400 Unexploded Grenades Throughout Engagement Site
- Grenades Spread Over 12 Grid Squares

VS

M30 w/SDF



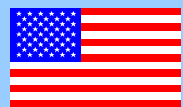
- 15 Rockets Required To Destroy Target
- 404 Grenades Per Rocket
- At <1% Dud Rate, Less than 60 Unexploded Grenades Remain At Engagement Site
- All Grenades Contained Within 1 Grid Square

Any Warfighter - Anywhere - All The Time



MLRS Worldwide

MOU Partners



United States



United Kingdom



France



Germany



Italy



Any Warfighter - Anywhere - All The Time

* Potential Customer

Distribution A: Approved for Public Release

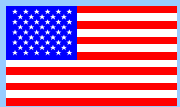
RS33-08060501-6 5 Jun 08



MLRS Worldwide



MOU Partners



United States



United Kingdom



France



Germany



Italy



Any Warfighter - Anywhere - All The Time

* Potential Customer

Distribution A: Approved for Public Release

RS33-08060501-7 5 Jun 08



Terminated Army Missile Programs

AD
AV MANEUVER
FIRE SUPPORT

~~STINGER~~



~~JAVELIN P3I~~



~~LOSAT~~



~~CKEM~~



~~Common
Missile~~



~~APKWS~~



JAGM

GMLRS



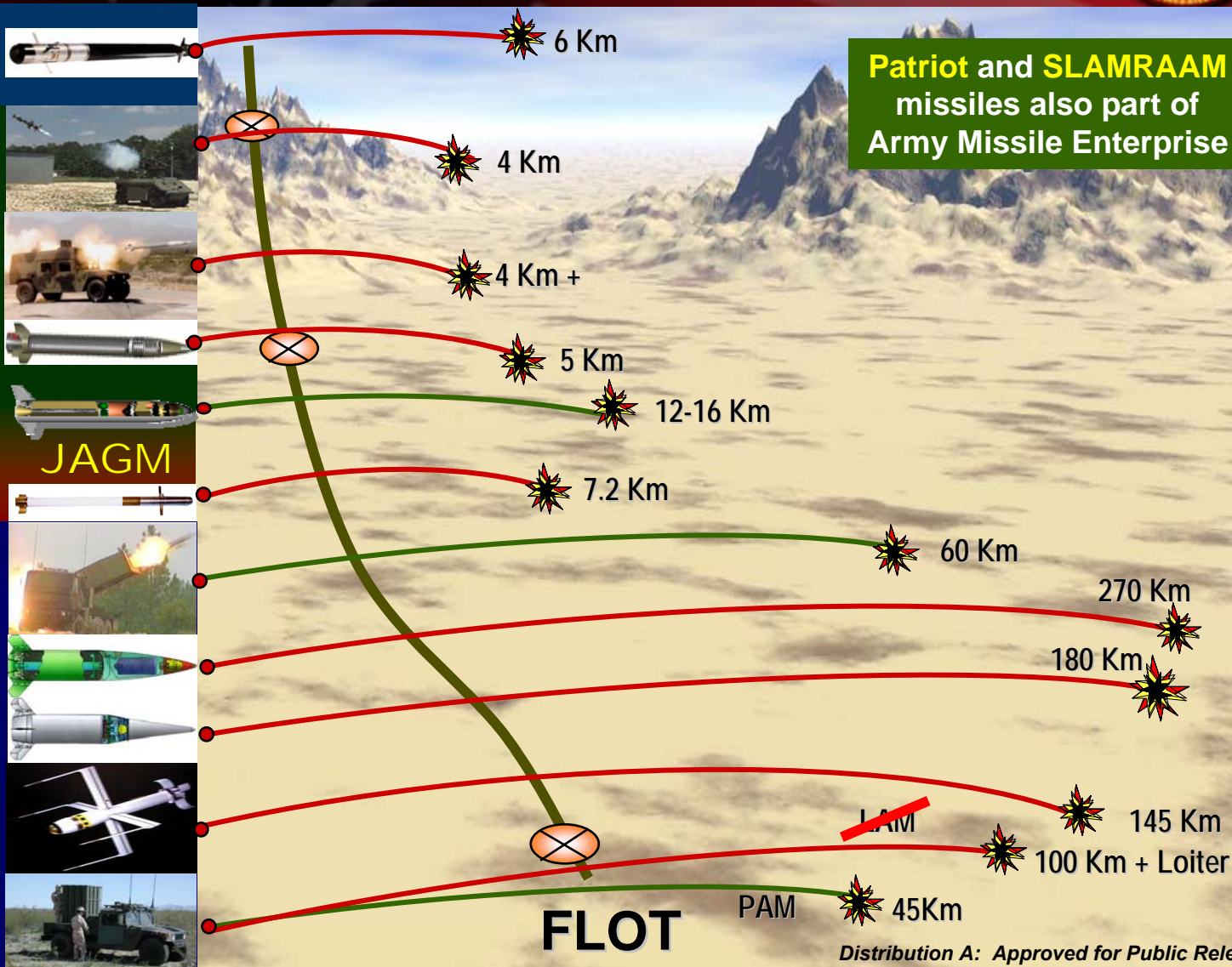
~~ATACMS
Unitary/
Penetrator~~



~~BAT P3I~~



NLOS-LS



Distribution A: Approved for Public Release

THE SPECTRUM OF THREATS REQUIRES A MIX OF MISSILE SYSTEM CAPABILITIES



Contemplated Capabilities



- Precision, precision, precision
- Elimination of UXOs
- Selectable warheads
- In-flight redirect
- Programmable trajectory
- Reduced signature
- Demil

Any Warfighter - Anywhere - All The Time



Suggestions



- PM / TCM relationship and requirements
- Get plugged into G-3 Ammo
- ASA(ALT)
- OSD
- Media – tell your story

Any Warfighter - Anywhere - All The Time



UNCLASSIFIED



...we never forget our real customer...



Any Warfighter - Anywhere - All The Time

Cannon Artillery and Mortar Precision Effects



Presented by: COLONEL Ole Knudson
Project Manager for
Combat Ammunition Systems

973 724-2003, ole.knudson@us.army.mil

"The presentation to the effect that disclosure of information does not imply any specific intent or commitment on the part of the U.S. to provide further information on the topic."



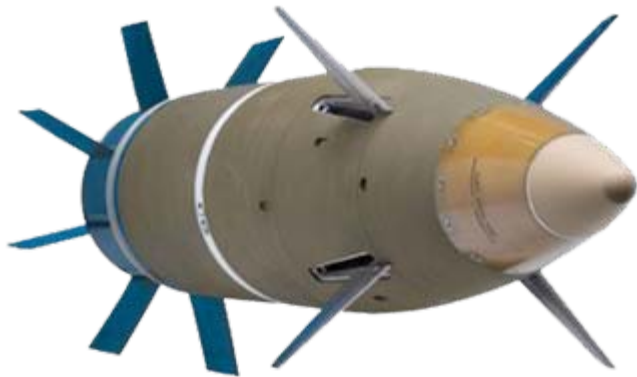
Cannon Artillery and Mortar Precision Effects Capabilities



- All weather 24/7 continuously “loitering” precision capability
 - ✓ Responsively and precisely attack targets...can precisely “mass” fires
 - ✓ Minimizes collateral damage...“discretion” & “close” engagements
 - ✓ Inherent scalability with multiple shooters and multi-round missions
 - ✓ Dramatically reduced logistics burdens (less qtys and transport/storage)
- Employed with current cannon artillery & mortar systems and structure...& accurate targeting systems (FS3, LLDR, PSS-SOF)
 - ✓ Easily additive to current systems and capabilities...“compatibility” is key
 - ✓ Maintains current smoke & Illum capabilities...“precision” smoke w/PGK?
 - ✓ Maintains area fire & suppressive fires capabilities...“precise” area fires?
- PM CAS Indirect Fire Precision Efforts
 - ✓ Excalibur provides 155mm artillery <10m CEP capability out to 40 kms
 - ✓ Precision Guidance Kit (PGK) for 155mm & 105mm artillery projectiles
 - ✓ Exploring 105mm artillery & 120mm mortar precision with ARDEC / ARL

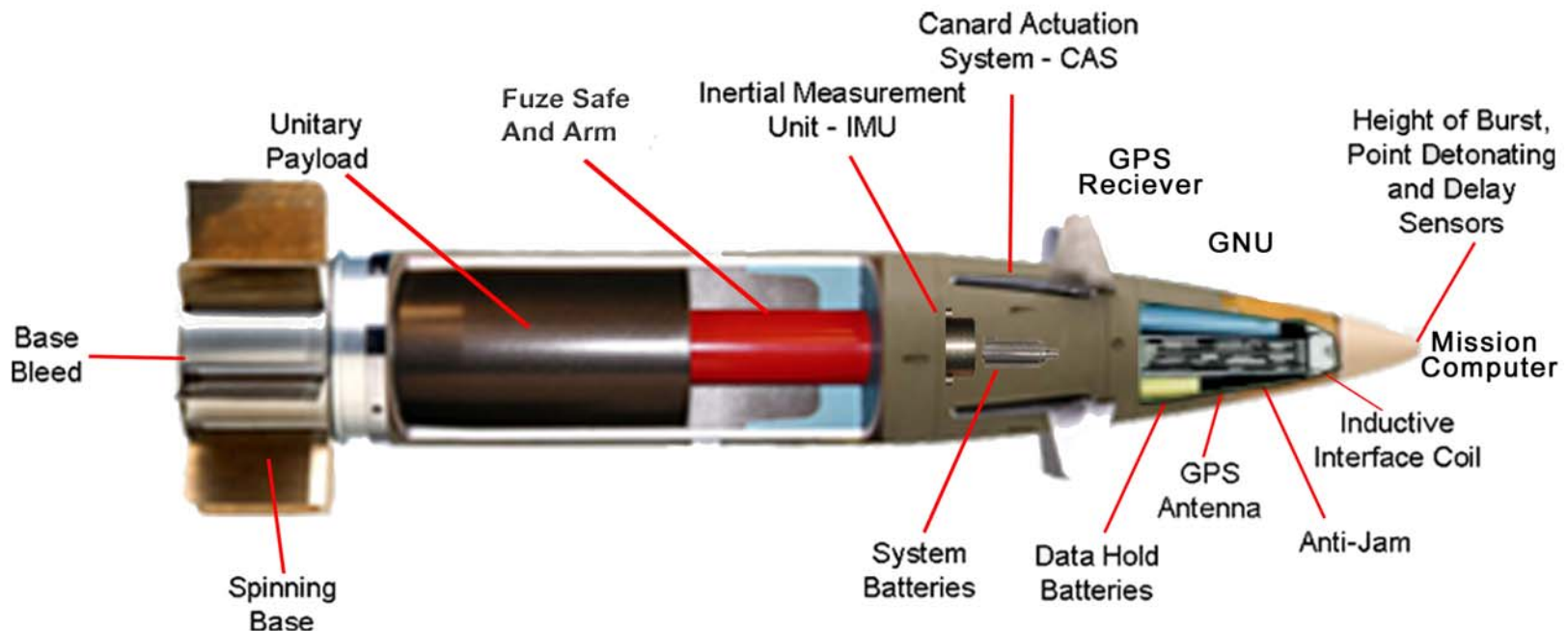


XM982 Excalibur



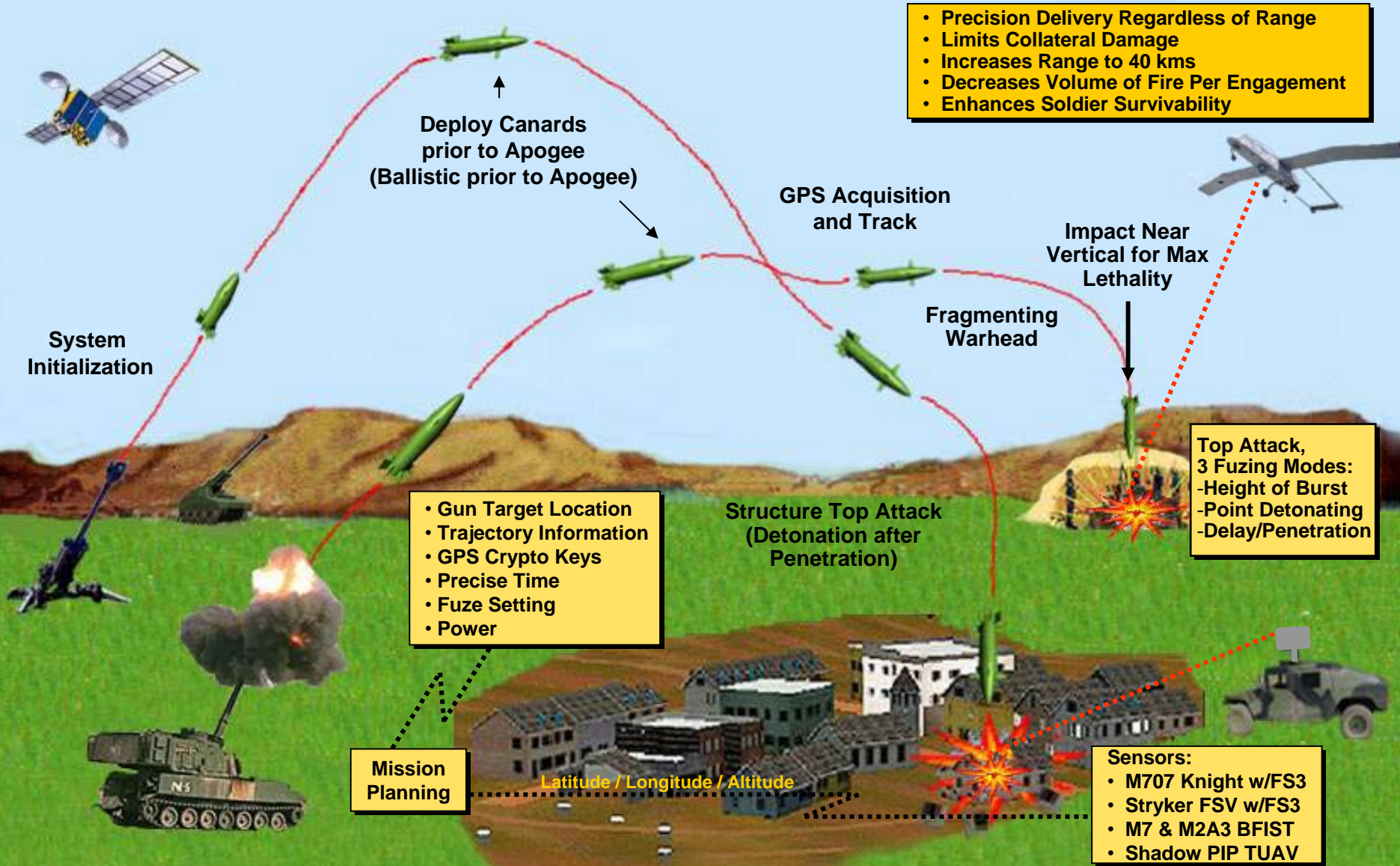
System Characteristics/Description:

- ✓ Precision Guided 155mm Cannon Ammunition (CEP < 10m)
- ✓ Fin Stabilized, Gliding Air Frame
- ✓ All Weather, Day/Night, Fire & Forget, Urban/Complex Terrain
- ✓ Compatible with NLOS-C, Paladin and LW155 Howitzer Platforms
- ✓ One Meter Length / 106 lb





Excalibur Concept of Operations





Excalibur Video





Excalibur Program Status



- Excalibur Block Ia-1
 - ✓ Operational use in theater
 - ✓ Block Ia-1 production deliveries ongoing
- Excalibur Block Ia-2 (longer range version)
 - ✓ Block Ia-2 operational test planned for Jun 09
- Excalibur Block Ib
 - ✓ Increased reliability and significantly reduced unit costs
 - ✓ Competitive Source Selection ongoing



Precision Guidance Kit (PGK) 155mm Projectile Accuracy

- Increased effectiveness (kills targets quicker)
- Increased stowed kills per platform
- Reduced collateral damage
- Reduced logistics burden
- Closer support of friendly troops

CEP vs. Range

w/o PGK

w/PGK

95m

115m

140m

275m

< 50m

< 50m

< 50m

< 50m

30 km

25 km

20 km

15 km

Paladin
M109A6

LW155
M777

Paladin
M109A6

LW155
M777

PGK Increment 1 Provides
CEP Accuracy of < 50 Meters



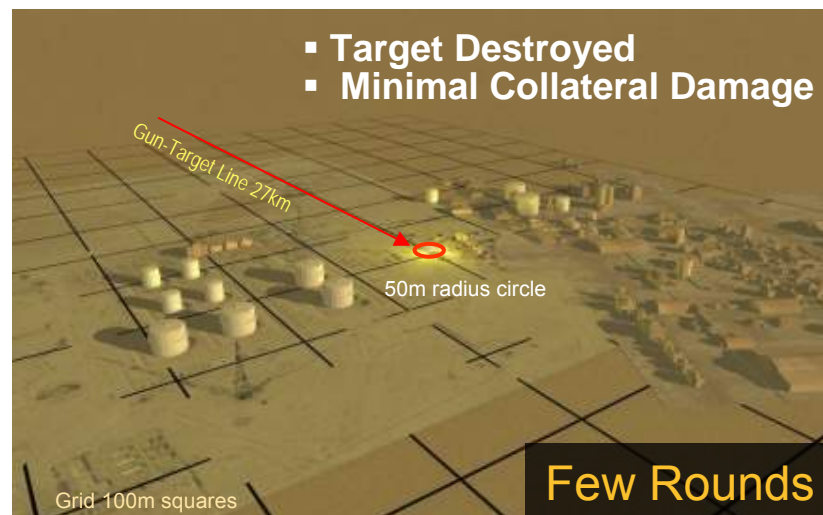
Operational Benefits



Today's Capability: 183m CEP*



PGK: $\leq 50\text{m}$ CEP



* M109A6 (Paladin) at 27km: 155mm (HE) M549A1

- Improves Accuracy – Significantly Reduces Ballistic Dispersion
- Significantly Decreases the Time Needed to Achieve Desired effects
- Minimizes Collateral Damage
- Increases Number of Kills per Basic Load of Ammunition
- Greatly Reduces Logistics Burdens



PGK Design (Increment 1)



- Fits in standard 155mm High Explosive artillery projectile fuze wells (deep intrusion)
- GPS guidance (incorporates SAASM)
- 20 Year Storage Life (no battery)
- Proximity & Point Detonating Fuzing



2007 Tech Demo Firing



PGK Video



PGK
Precision Guidance Kit



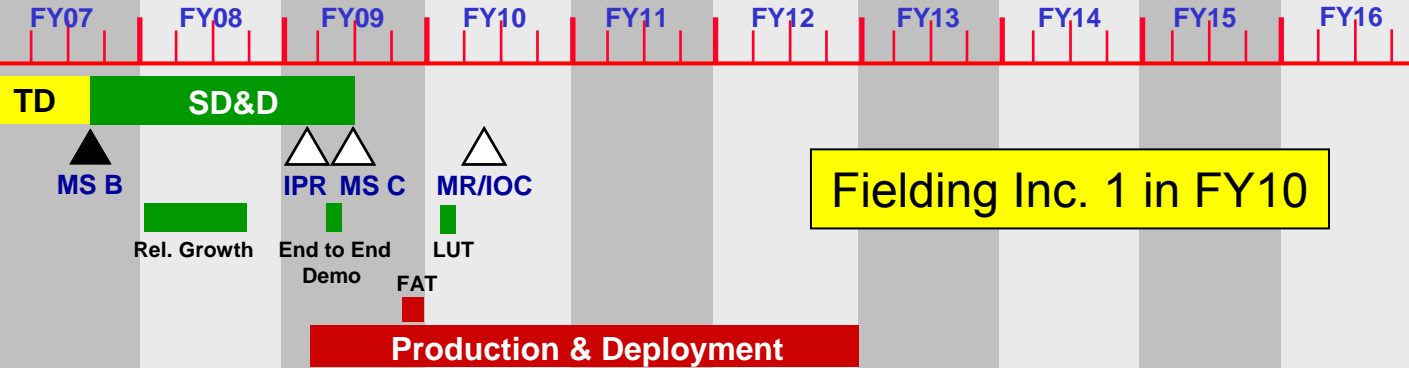
PGK Incremental Schedule



17 Oct 07

PGK Increment 1

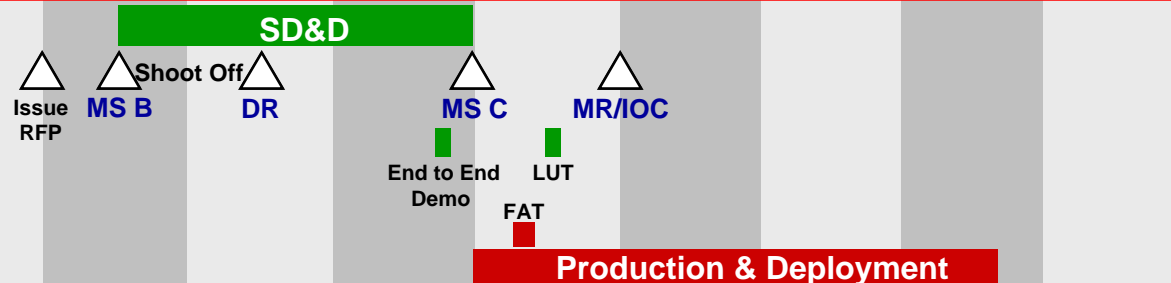
- $\leq 50\text{m}$ CEP
- 155mm HE only
- Paladin & M777A2



PGK Increment 2

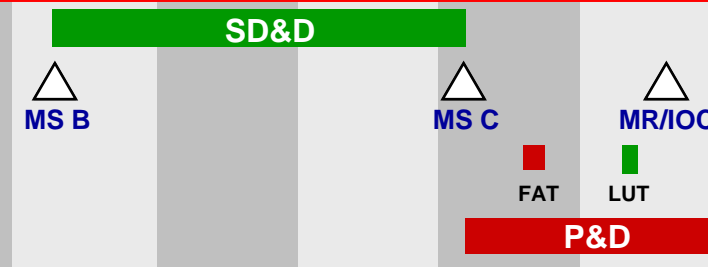
- $\leq 30\text{m}$ CEP*
- Adds 105mm (HE)*
- NLOS-C (O)

*Requires Digitized M119A2



PGK Increment 3

- $\leq 30\text{m}$ CEP
- Adds 105mm & 155mm Cargo
- NLOS C (T)





Emerging Needs/ Future Requirements



- IBCT Organic Precision Requirements
 - ✓ 40 Plus IBCTs within Army structure...have mortars & 105mm
 - ✓ PGK-2 is funded...implemented with 105mm digitization
 - ✓ Need for organic very responsive precision with <10m CEP
- “Cheap” or “Very Affordable” Precision is “coming soon”
 - ✓ Key technologies...IMUs, GPS, S&As, Power, AJ, & SALs
 - ✓ ARDEC/ARL VAPP effort to mature components and integrated concepts...applicable to artillery and mortars
 - ✓ Several Industry efforts ongoing...will enable competition
 - ✓ Wider use in training...confidence, proficiency, and quantities

ORDNANCE AMMUNITION

THE FUTURE PERSPECTIVE

COL MICHAEL T. McBRIDE

Deputy Commander / Chief of Staff
US Army Ordnance Center and School

Presented to:
Precision Strike Association/NDIA
Armaments Technology Firepower Forum

11 June 2008

GO ORDNANCE!



PURPOSE



BLUF: OD Corps continues to execute core competence to ARM THE FORCE and work with the total ammunition logistics community to support Soldiers and shape the future of ammunition logistics

BRIEFING OUTLINE

- OD Ammo Team
- OD Corps in Sustainment Center of Excellence
- Change in OD Corps Support
- OD Ammo Vision 2030
- OD Ammo Log Collaborations/Initiatives



ORDNANCE CORPS AMMO TEAM



Chief of Ordnance – Proponent, Deputy CDR CASCOM

Ordnance Center and Schools

- Ordnance Mechanical Maintenance School
- Ordnance Munitions and Electronics Maintenance School w / TRADOC Munitions System Manager Office OPCON

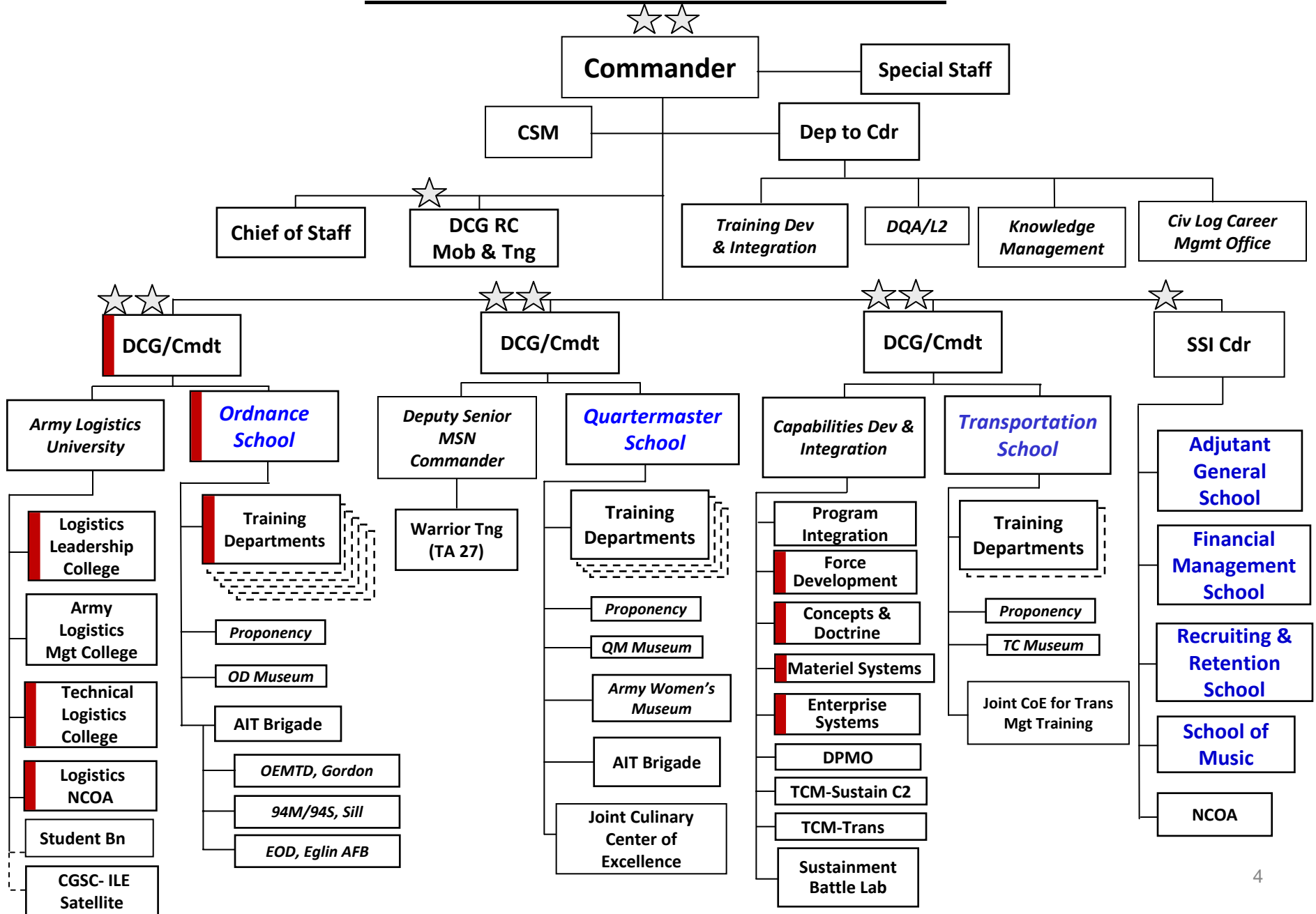
Combined Arms Support Command

- Capabilities Development and Integration
- Training Development

WE ARE – Ammo **D**octrine, **O**rganization, **T**raining, **M**ateriel, **L**eadership Development, **P**ersonnel, **F**acilities (**DOTML-PF**)

CASCOM

The Sustainment Center of Excellence





FROM OUR FOXHOLE - NOW



- Army Transformation (BCT, SB, ESC, TSC) is working
- Multifunctional Logistics is necessary and also working
- Ammo Modular Unit Organization - a success story
- Ammo Soldiers
 - Building the force to meet Transformation
 - Training Ammo Soldiers to be Mod Force experts
 - Leader Dev – OD ammo officer Tng/PD a challenge
 - Unit-level proficiency – an on-going challenge
- Ammo Logistics Support Teaming – Improving with great coordination from Army, JMC/DAC, PEOs, ARDEC ammo log leaders



HISTORICALLY



WE HAVE **ALWAYS** BEEN ABLE TO:



RECIEVE



STORE



ISSUE

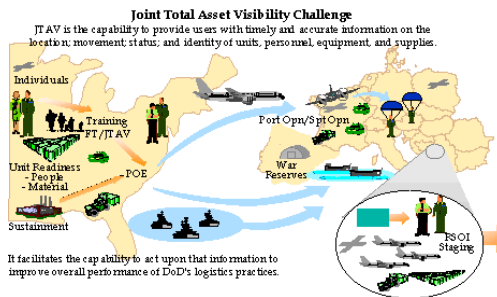
And ... The OD Corps has been a leader in Log Innovation!

- Maneuver Oriented Ammo Distribution System – 1987
- MOADS PLS – 1989
- Container Roll-on – Roll Off Platforms (CROPS) 1997
- Modular Medium/Heavy Ammo Platoons – 1994 concept
- IBCT Ammo Resupply System 2001

BUT...



EVOLVING MISSIONS INCLUDE



E-2-E Vis/Accountability



Ammo Soldiers in fwd combat resupply opns



Recover-Repkg- Redeploy
Issued CL V



Log Self-Protection



Safe Mgt of Ammo / CEA



AMMO SUPPORT - THE TOTAL FORCE



We will support an evolving mix of future forces



Mod Force BCT



Future Force



SBCT

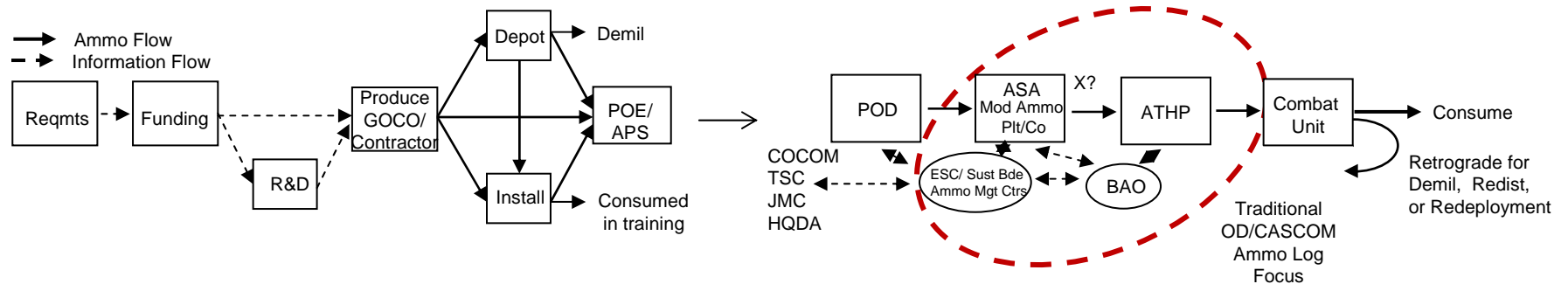
OUR FUTURES CHALLENGE

- Ammo support to High-Low tech mix of forces for the near-mid future
- With limited budget, less log footprint
- Improved Joint support to other services
- Continued support to coalition forces



Wholesale/retail and Direct/General Support

The Lines are fading – FAST



- Ammo Soldiers are operating at combat battalion and lower level
- JMC LARs and DAC QASAS deploy with HQs and sustainment units
- PEOs are rapidly developing and fielding new systems to deployed units
- Contractors perform support missions at all levels including BCTs
- Ammo units are supporting and being trained at installation level
- Experts from all organizations are developing and exchanging LLs and changing TTPs/doctrine, training

The future of ammo logistics requires a new Vision



ORDNANCE AMMO VISION 2030



BACKGROUND

- Ordnance Corps Vision is Dated
 - Pre Modular Force
 - Pre OIF/OEF
 - Considerable change/LL across the spectrum
- Chief of OD directed a new vision
 - *“Answer these 3 Questions...”*
 - *Where are we today?*
 - *What has Changed and What is Missing?*
 - *What do we need to look and be like in 2030?*



ORDNANCE AMMO VISION 2030



KEY AMMO ISSUES

- Where (and Who...) are all the Experts? Across the full life-cycle spectrum of ammo logistics
- Professional Development / Military Education
- Skilled BAO teams for the BCT CDR
- Perishable skills lost at home station
- Surveillance & Quality Assurance
- BCS3 vs. MUREP vs. LOGSTAT
- Battlefield Task Migration – New missions, new support elements – not all wearing your patch, some civilians
- Ammo Automation MOS – New 89A
- New families of smart, brilliant, scalable, munitions and missile requiring new handling, packaging, maintenance



ORDNANCE AMMO VISION 2030



AMMO WARRIOR 2030

- Officer
 - Warrant Officer
 - Non-Commissioned Officer
 - Enlisted
 - DA Civilian
 - Contractor
- Each with different areas of responsibility and expertise – but ALL with a solid tactical and technical understanding of ammunition and ammo support systems. They share a common operating picture of the battlefield and status of ammo.



FROM OUR FOXHOLE THE FUTURE



- **Ammo and Ammo Soldiers** – We will have less of both, they will need to be smarter, multi-mission, rapidly deliverable, safe, survivable, accessible, and completely reliable
- **Training** – Life-long, adaptive, integrated across ammo log SME team, best of virtual, on-line, and resident capabilities
- **Information Technology** - Leverage best solutions for ammo accountability, ammo health monitoring, SA, and C4
- **Rearm Systems** – Mobility, survivability, rapid rearm
- **Distribution Platforms and MHE** – Common across the Future Force, designed to fully meet all needs – seamless interface with rearm systems, minimize man-in-the-loop



CURRENT OD AMMO TEAMING



- ❖ **Army G-3** - Munitions Strategic Campaign Plan
- ❖ **Army G-4** - Unit Munitions Visibility, Accountability, Expenditure IPT
- ❖ **PEO Ammo/PD Joint Services** – Ammo Logistics R&D IPT Initiative
- ❖ **ARDEC** - Dev Team member to review munitions supportability analysis, training requirements
- ❖ **DAC and CASCOM Training Dev** – Ammo Training Community of Practice, Knowledge Harvesting
- ❖ **DAC Theater Assessment** – Capturing ammo LLs



A PARTING SHOT



FACT - NO MATTER HOW AMMO LOG UNITS AND MANAGERS HAVE BEEN ORGANIZED, TRAINED, EQUIPPED, DEPLOYED, AND UTILIZED - THE ARMY HAS NOT LOST AN ENGAGEMENT BECAUSE OF A FAILURE OF AMMO LOGISTICS

A GREAT RECORD THAT ALL AMMO LOGISTICIANS CAN PROUDLY OWN ...

AND CANNOT LOSE!



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Deputy Commander / Chief of Staff
US Army Ordnance Center and Schools
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CW5 DON DEHNEL

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BACKUP SLIDES



- ❖ [Definitions](#)
- ❖ [Briefing Support](#)
- ❖ [Current Theater Operations](#)
- ❖ [Army Mod Force Units](#)
- ❖ [Army Ammo Transformation](#)
- ❖ [OD Training Overview](#)



DEFINITIONS



AOE	Army of Excellence, pre-Mod Force Army organization
APE	Ammunition Peculiar Equipment
APS	Army Pre-positioned Storage
ASA	Ammo Supply Activity, any ASA in theater
ASP	Ammo Supply Point, receives, stores, issues ammo to units
ATHP	Ammo Transfer and Holding Point, mini-ASP at BCT level
ATP	Ammo Transfer Point, AOE Div team to
BCT	Brigade Combat Team
CEA	Captured Enemy Ammunition
COP	Community of Practice or Common Operating Picture
ESC	Expeditionary Support Command
E-TO-E	Joint End to End distribution process
IBCT	Interim Brigade Combat Team
IPE	Industrial Plant Equipment





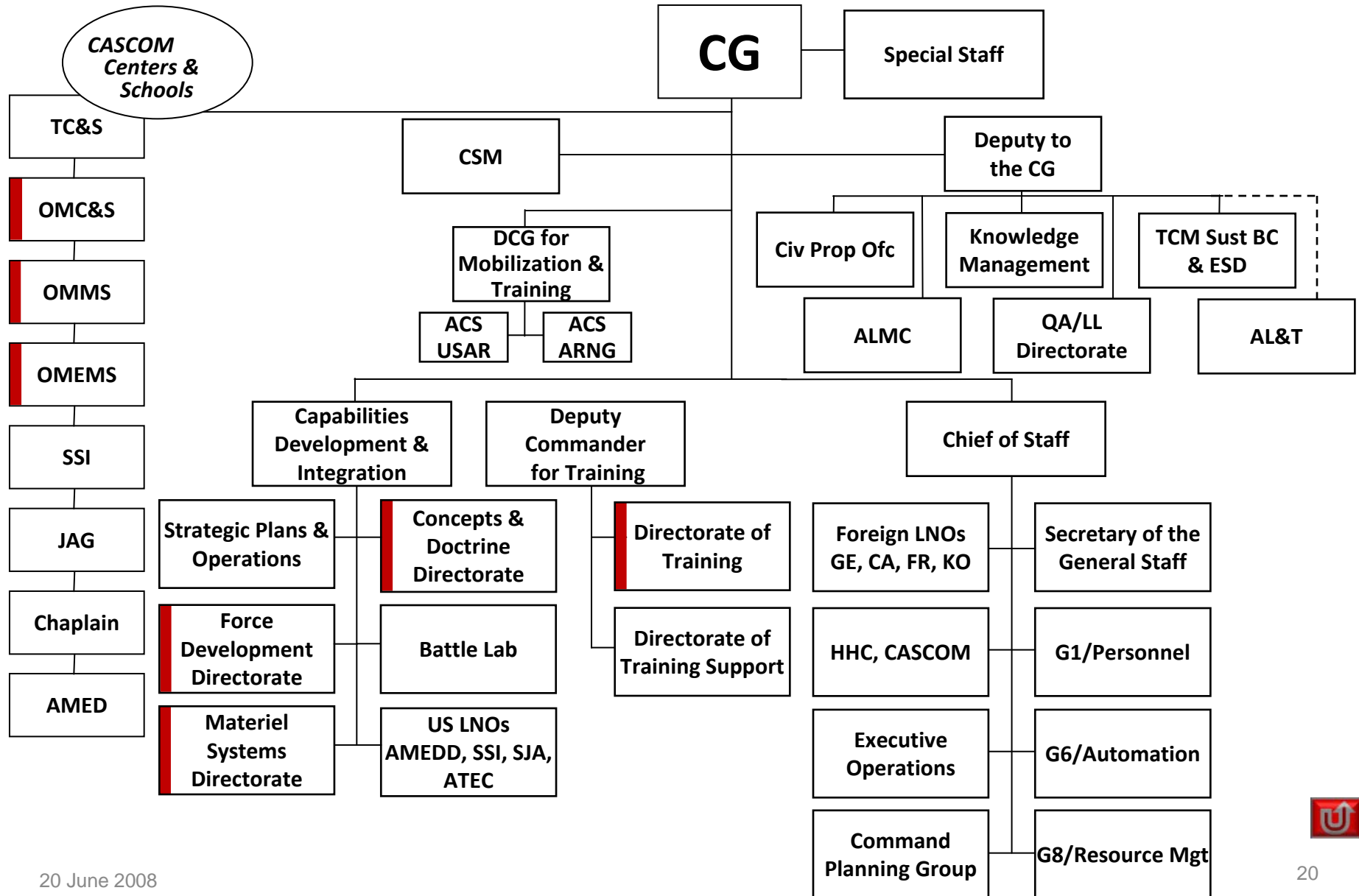
DEFINITIONS (CONT...)



LHS	Load Handling System, similar to PLS but on HEMTT truck
MHE	Materiel Handling Equipment (forklifts/cranes)
MOADS	Maneuver Oriented Ammo Dist System, a distribution-based ammo spt system that moved Army away from supply point support
PD	Professional Development
PLS	Palletized Load System – self-loading truck and platform system
POD/POE	Port of Debarkation/Embarkation
QASAS	Quality Assurance Specialist (Ammo Surveillance)
SA	Situational Awareness
SB	Sustainment Brigade, Mod Force primary support unit
SBCT	Stryker Brigade Combat Team
TAV	Total Asset Visibility
TMDE	Test, Measurement, and Diagnostic Equipment
TSC	Theater Support Command
TTP	Tactics Techniques, and Procedures



CASCOM Today





AMMO LOGISTICS



“The Future Ain’t What it Used to be”

1988

- Warsaw Pact
- Extreme Lethality
- Primarily Conv CL V
- Army, Joint/Cbd
- AirLand Battle Force
- Linear Battlefield
- Fwd Based Forces
- Supply Point Log
- Pre MOADS-PLS
- Breakbulk Ammo

2008

- GWOT
- Measured Lethality
- Conv/Precision Mun
- Army evolving to Joint
- BCT-SBCT- Mod Force
- Non Linear Battlefield
- Mixed - Expeditionary
- Supply Pt/Dist Mixed
- Flex Mod Log PLS/LHS
- CROPS, Mix CL/Single

2018

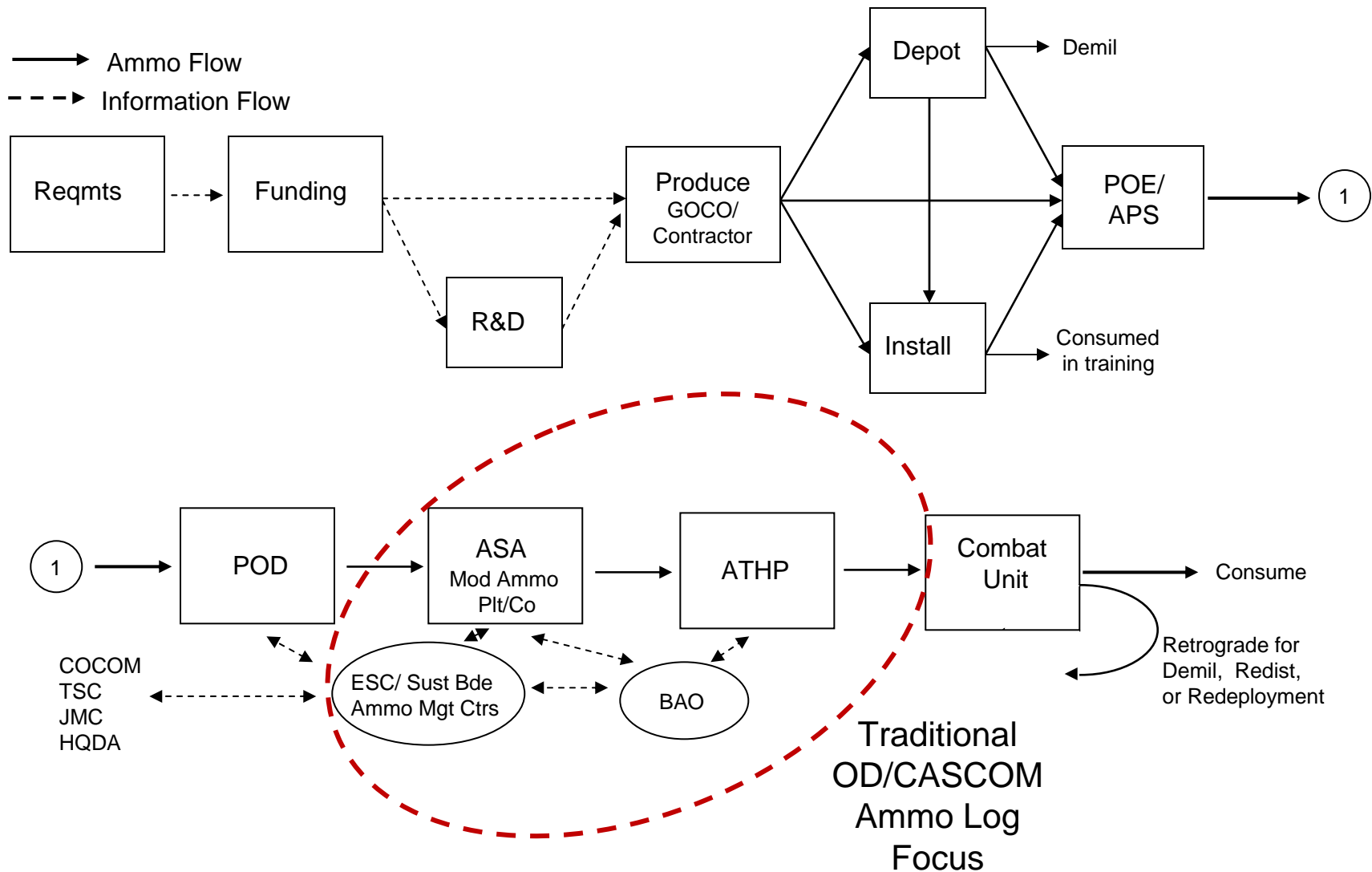
- Full Spectrum Threat
- Selective Lethality
- Precision Munitions
- Joint Forces
- Mod/Future Force
- Noncontiguous
- Joint – Expeditionary
- Dist Based Logistics
- CLV Pkg/Auto Rearm
- Constrained Budget
- Reduced Log Foot

We’ve come a long way, but – a long way to go...





AMMO LIFECYCLE





ORDNANCE AMMO VISION 2030



CHIEF'S GUIDANCE:

● Three Core Competencies:

- Maintenance
- Ammo
- EOD

● Bring the full spectrum of ammo stakeholders together – Army Staff, DESB, AMC, TRADOC, PEO Ammo, JMC/DAC, CASCOT, OC&S, HRC, USAR, others

● Completed May 2008





ORDNANCE AMMO VISION 2030

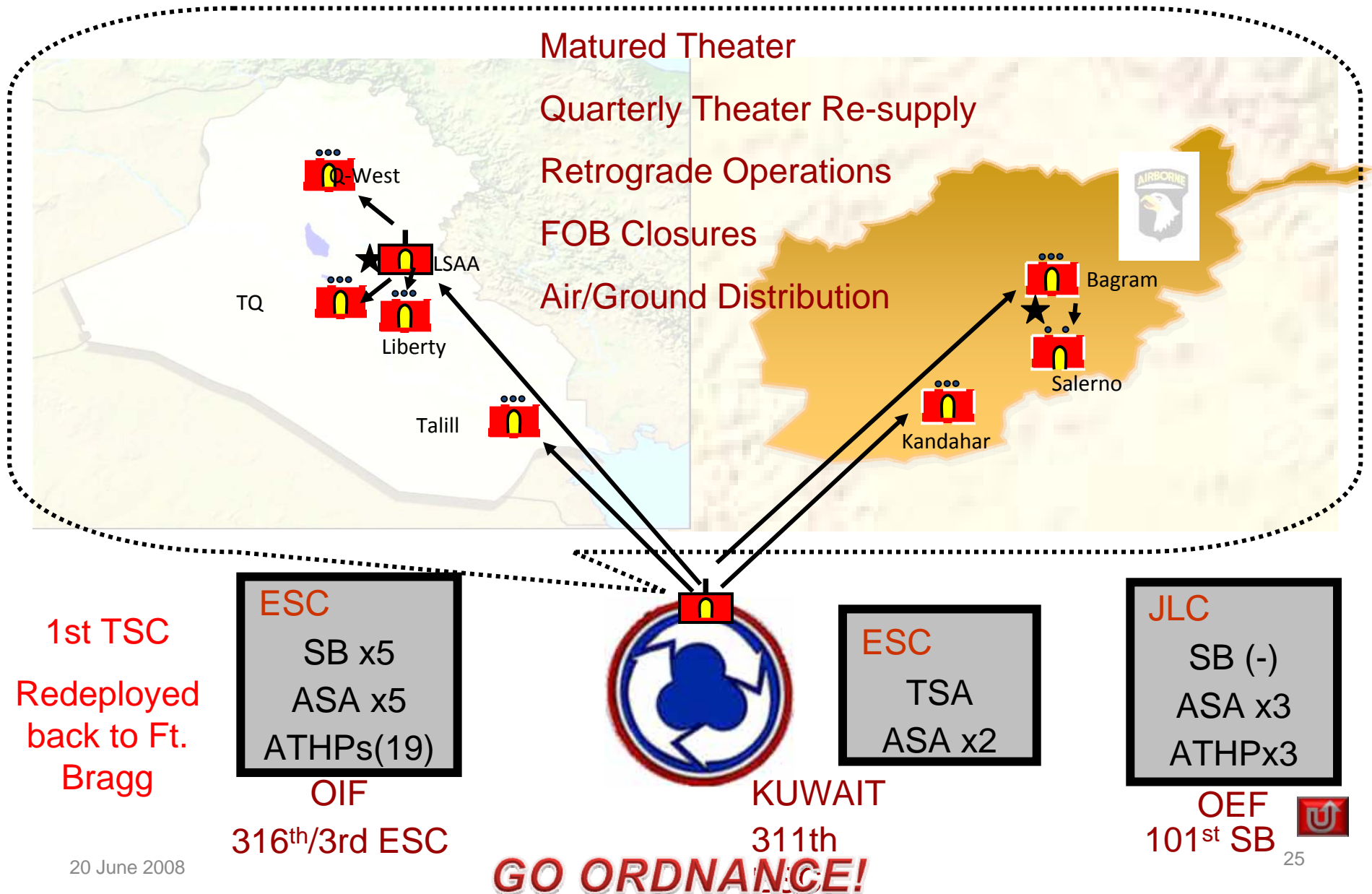


MAJOR TOPICS

- **Equipment:** Munitions, MHE/APE/IPE, Info Tech, Distribution, TMDE, Packaging/Handling
- **Organizations:** Integrated - tactical to Strategic, Joint, Modular, Split-Based, Full Lifecycle Functions
- **Training:** Tactical/Technical, core munitions competencies, career-long path, certification, best mix of virtual, web-based, and resident training
- **Reach Capabilities:** True TAV/SA, tele-presence, direct, real-time knowledge collaboration/management



Current Theater Ammunition Operations





ARMY SUPPORT UNITS



TSC (3 WO)

1st TSC Ft. Bragg
8th TSC Hawaii
21st TSC Germany

Red is a part of Grow the Army - GTA

ESC (2 WO)

3rd ESC Ft. Knox
13th ESC Ft. Hood
?? Ft. Lewis
19th ESC Korea

Sustainment Bdes (currently 2 WO going to 1)

1st SB Ft. Riley
3rd SB Ft Stewart
4th SB Ft. Hood
7th SB Ft. Eustis
10th SB Ft Drum
15th SB Ft. Hood
16th SB Germany
29th SB

43rd SB Ft. Carson
45th SB Hawaii
64th SB
82nd SB Ft. Bragg
101st SB Ft. Campbell
501st SB Korea
507th SB
593rd SB Ft. Lewis





ACTIVE DUTY AMMUNITION UNITS



- 3 Ord BN-none are true Ord Bn w/numbered TOE Ammo Co's:
 - 80th Ord Bn, Ft. Lewis, WA (to convert to a CSSB w/AAE)
 - 83rd Ord Bn, Japan (to convert to an CSSB w/AAE)
 - 6th Ord Bn, Korea
- 5 Ord Companies CONUS*
 - 8th Ord Co, Ft. Bragg, NC (HQ & 3 plts)
 - 24th Ord Co, Hunter Army Airfield, GA (HQ & 5 plts)
 - 60th Ord Co, Ft. Carson, CO (HQ & 3 plts)
 - 63rd Ord Co, Ft. Lewis, WA (HQ & 3 plts)
 - 664th Ord Co, Ft. Hood, TX (HQ & 5 plts)
- OCONUS*
 - 23rd Ord Co, Germany (HQ & 2 plts)
 - 17th Ord Co, Korea
 - 52rd Ord Co, Korea
 - 84th Ord Co, Korea

*Permanent station - units/plts may be deployed





BCTs



BCTs (48-Endstate)

Ft. Benning (1 - HBCT)	Alaska (2 – IBCT(ABN)/SBCT)
Ft. Bliss (6 – 4 HBCT/2 IBCT)	Germany (1 – SBCT)
Ft. Bragg (4 – IBCT(ABN))	Hawaii (2 – IBCT/SBCT)
Ft. Campbell (4 – IBCT)	Italy (1 – IBCT(ABN))
Ft. Carson (5 – 3 HBCT/2 IBCT)	Korea (1 - HBCT)
Ft. Drum (3 – IBCT)	
Ft. Hood (4 – HBCT)	
Ft. Knox (1 – IBCT)	
Ft. Lewis (3 – SBCT)	
Ft. Polk (1 – IBCT)	
Ft. Riley (3 – 2HBCT/IBCT)	
Ft. Stewart (4 – 2 HBCT/2 IBCT (1 – IBCT))	
White Sands Missile Range (1 – HBCT)	

Red is a part of Grow the Army - GTA





FIRES AND AVN (CAB) BDES



Fires Bdes (6)

1 – Ft. Bliss
1 – Ft. Bragg
1 – Ft. Hood
1 - Ft. Lewis
2 – Ft. Sill

Avn Bdes (11)

Ft. Bliss
Ft. Bragg
Ft. Campbell (2)
Ft. Drum
Ft. Hood
Ft. Riley
Ft. Stewart (HAAF)
Germany
Hawaii
Korea

Red is a part of Grow the Army - GTA





RC AMMUNITION UNITS



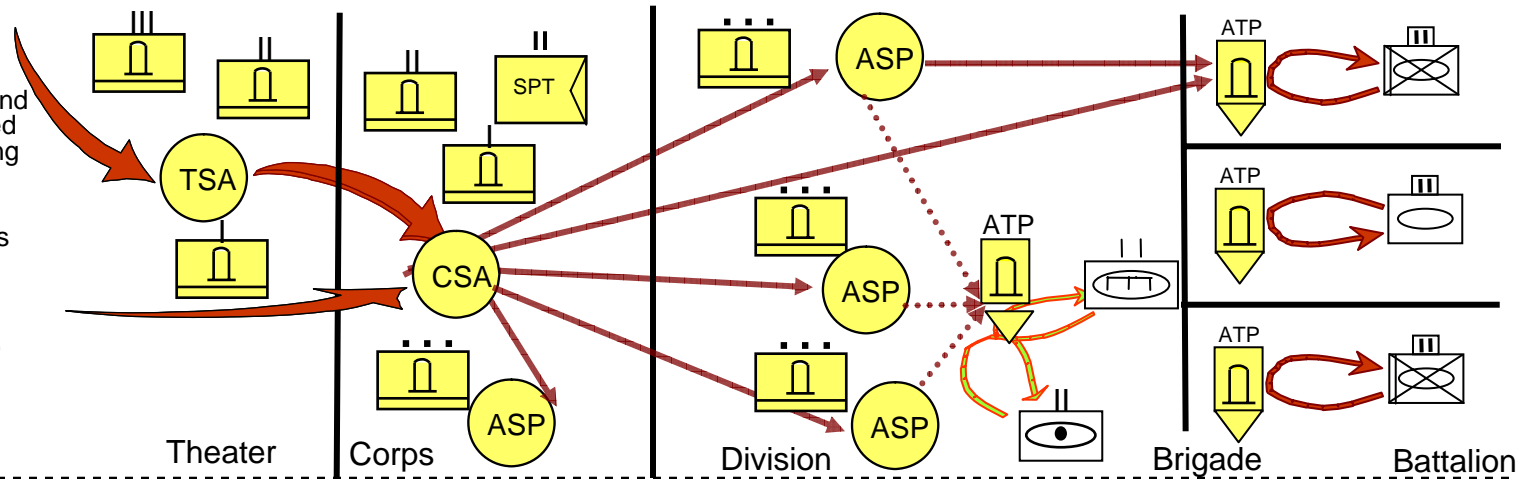
- 1 Ammo Group:
 - 303 Ord Group, Springfield, IL
- 4 Ord Bn:
 - 125th Ord Bn, Billings, MT
 - 320th Ord Bn, Lincoln, NE
 - 321st Ord Bn, Cross Lane, WV
 - 322nd Ord Bn, Kenova, WV
- 13 Ord Ammo Co.
 - 163rd Ord Co, Santa Ana, CA (HQ, HLP & MLP)
 - 221st Ord Co, Ft. Wayne, IN (HQ, HLP & MLP)
 - 261st Ord Co, Cross Lane, WV (HQ, HLP & MLP)
 - 266th Ord Co, Aguadilla, PR (HQ, HLP, MLP)
 - 295th Ord Co, Hasting, NE (HQ, HLP & MLP)
 - 351st Ord Co, Romney, WV (HQ, HLP & MLP)
 - 395th Ord Co, Appleton, WI (HQ, HLP & MLP)
 - 452nd Ord Co, Aberdeen, SD (HQ, HLP & MLP)
 - 592nd Ord Co, Billings, MT (HQ & MLP)
 - 802nd Ord Co, Gainesville, GA (HQ & MLP)
 - 811st Ord Co, Rainelle, WV (HQ, HLP & MLP)
 - 826th Ord Co, Madison, WI (HQ, HLP & MLP)
 - 962nd Ord Co, Plattsburg, NY (HQ & MLP)



Transformation - Arm

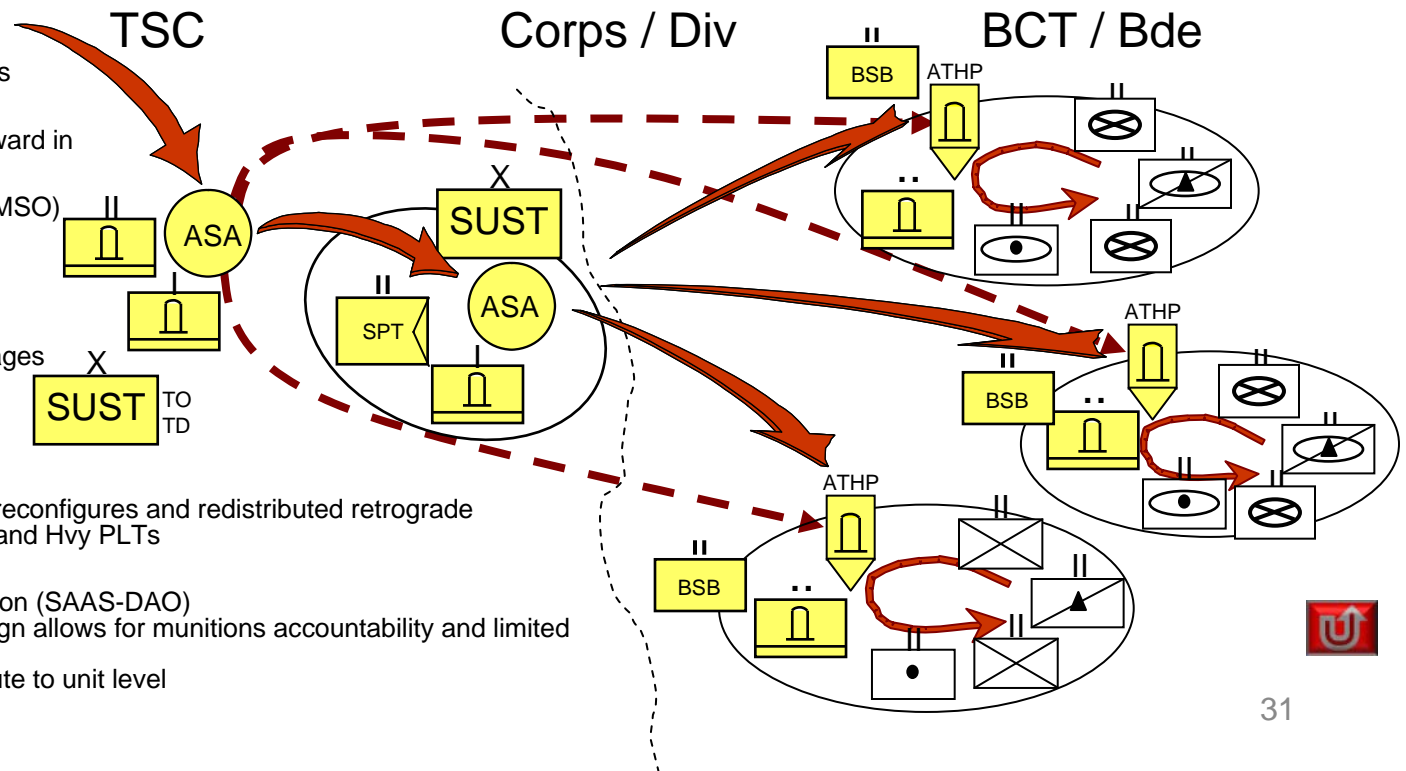
From

- Modular Ammo CO HQs and PLTs, BNs and Groups based on geographical support using supply point logistics
- Reliance on other echelons for support
- Corps provided ASP and storage areas in Division AO



TO

- Modular Ammo CO HQs and PLTs, BNs based on METT-TC
- Tailored configured loads delivered forward in the battle space
- Supports Mission Staging Operations (MSO)
- TSC / ESC
- - Receive, store, issue and reconfigure Configured loads (CL) and build Mission Configured Loads (MCL)
 - Maintain, manage, theater level stockages
 - Support theater opening
 - SAAS-MMC in SUS DMC for AMMO management
- Div / Corps
 - limited reconfiguration of MCLs and reconfigures and redistributed retrograde
 - METT-TC organized with mix of Med and Hvy PLTs
- BCT / Bdes
 - Embedded Ammo management function (SAAS-DAO)
 - Brigade organic 13 soldier ATHP design allows for munitions accountability and limited storage (SAAS-ASP)
 - Distro platoons and companies distribute to unit level
 - Limited ability to reconfigure loads

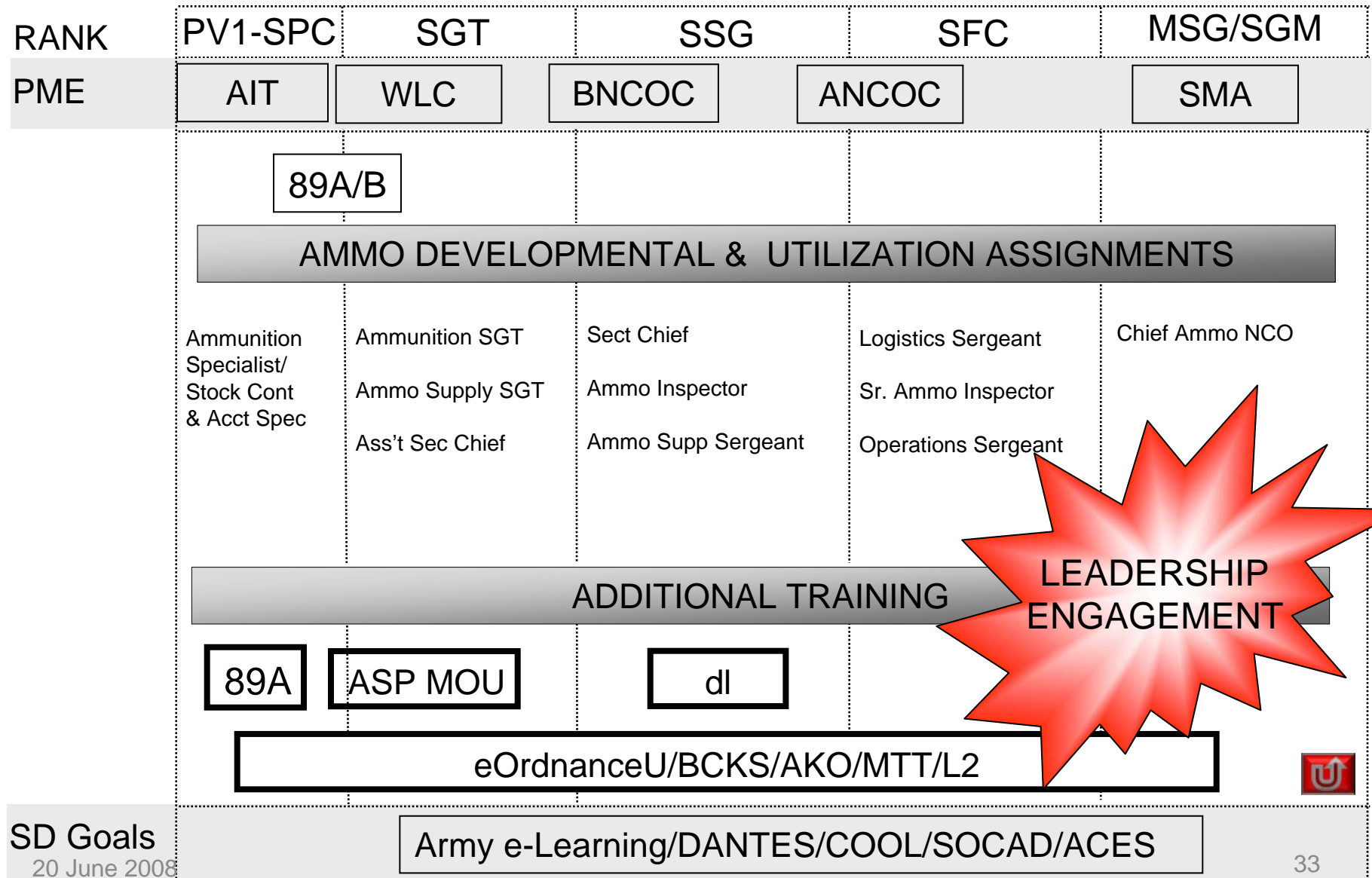


OK...What's Different at MY BDE Level – AOE vs BCT?


Personnel - 6		Equip	Mission	Capabilities
<u>From</u>	E-6 89B	SAAS – ATP PLS TRK x 3 PLS TRL x 3 RTFL x 2	Provide ammo spt to Bde sector. Receives mission guidance/ priorities from DAO .	“Transfer Point” PLS Flatrack Exch or transload ammo stocks from corps trucks to combat unit trucks.
DIV	E-5 89B			
ATP	E-4 89B x 2			
	E-3 89B x 2			
89B - Ammo Specialist			<u>AOE Division</u> managed/ distributed ammo to bdes	
Personnel - 13		Equip	Mission	Capabilities
<u>TO</u>	WO2 890A	SAAS – ATP MTS PLS TRK x 3 PLS TRL x 3 TRK CGO x 1 RTFL x 2	Provide ammo spt to BCT. Receives mission guidance and priorities from BAO .	“Mini-ASP” Receive, store, Issue, acct for Bde ammo stocks Limited inspection and maint of CL V Stocks. REC/ISS 62 STONS STORE 14 STONS SURGE 138 STONS
BCT ATHP	E-6 89B			
	E-5 89A*			
	E-5 89B x 2			
	E-4 89A*			
	E-4 89B x 4			
	E-3 89B x 3			
*89A - Ammo Stock Records and Acct Spec – New MOS			<u>BCT</u> manages, accounts for, and distributes its ammunition	



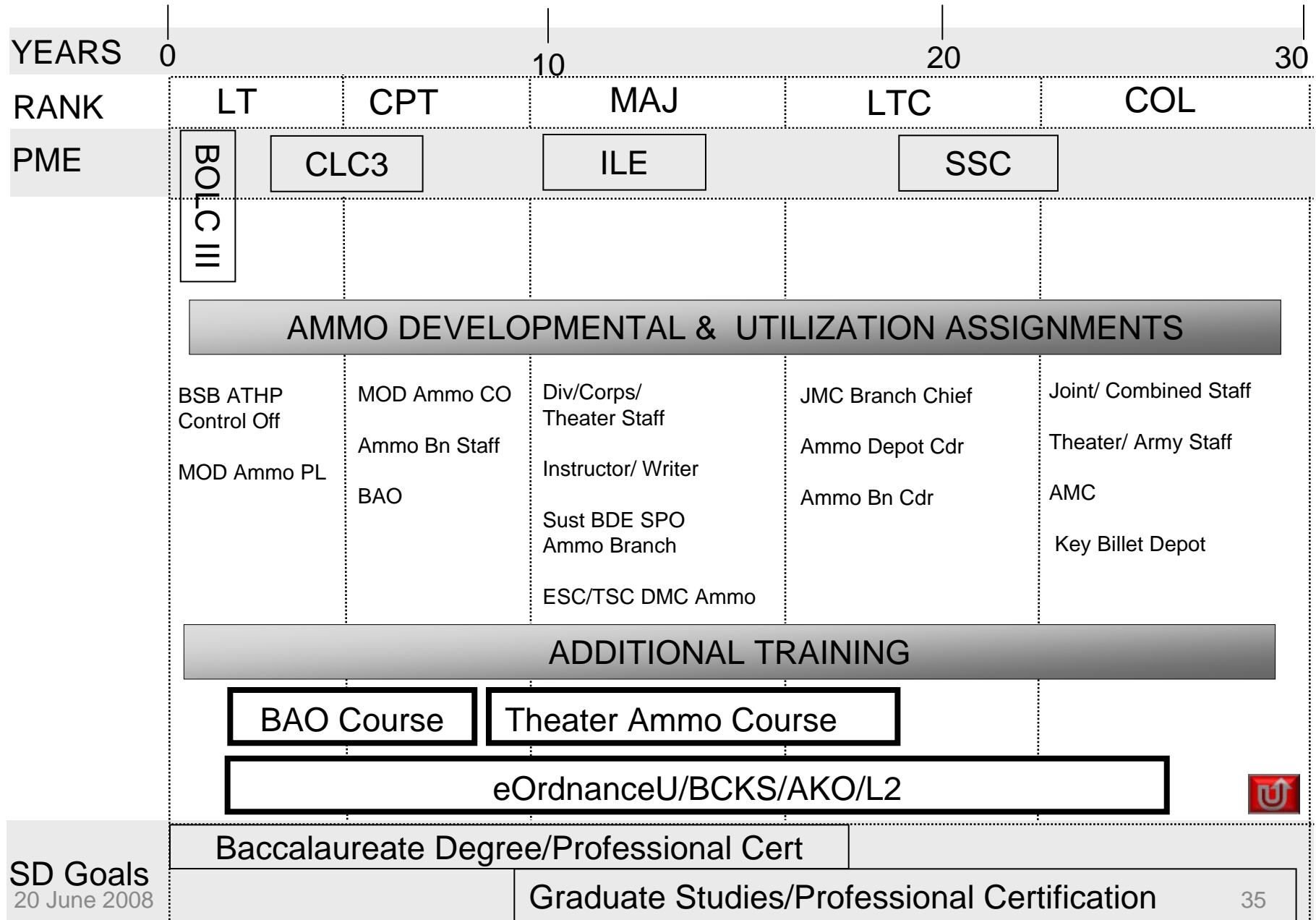
Ordnance Enlisted Training & Development Model



Warrant Officer Training & Development Model

RANK	WO1	CW2	CW3	CW4	CW5
PME	WOBC		WOAC	SWOC	SWOSC
AMMO DEVELOPMENTAL & UTILIZATION ASSIGNMENTS					
	BSB ATHP	Advisor	Advisor	Sr. Advisor/Manager	
	Accountable Off	Instructor/ Writer	Instructor/ Writer	(ASCC/Joint Command)	
	MOD Ammo PL/CO	Distro Management Center (DMC)	DMC (ESC/TSC)	DA (G-3/G-4)	
		(SB/ESC/TSC)	TNG/Combat Developer		
			Combat Readiness Ctr		
ADDITIONAL TRAINING					
	↑ WOBC SL				
	eOrdnanceU/BCKS/AKO/L2				
SD Goals 20 June 2008	Baccalaureate Degree/Professional Cert				
				Graduate Studies/Professional Certification	

Ordnance Officer Training & Development Model





Precision Strike Association & NDIA Picatinny Chapter

Intelligent Munitions System (IMS)

June 2008

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PM CCS Mission

Provide the Warfighter world-class close combat, force protection & assured mobility capabilities across full spectrum operations through professional, integrated Joint Life-Cycle Management.



Intelligent Munitions System (IMS)

Characteristics (1 of 2)

- **IMS SYSTEM CHARACTERISTICS:**

- **Evolutionary acquisition program developed in an incremental approach**
- **An integrated system of sensors, lethal anti-vehicle (AV) and anti-personnel (AP) munitions, software & communications**
- **Capable of employment for the detection, classification, tracking, and engagement of ground targets**
- **Operational Capabilities:**
 - **Force Protection**
 - **Networked Lethality**
 - **Enables Assured Mobility**
 - **Enhances Situational Understanding**
 - **Denies the enemy freedom of action**
 - **Enables the Urban fight**



Intelligent Munitions System (IMS)

Characteristics (2 of 2)

- Provides the Force with a networked munitions system that provides enhanced capabilities over traditional stationary obstacle/barrier systems
- IMS supports transitions, hasty and deliberate defense, cordon and search, isolation of urban areas, route and convoy security, thereby enabling a scalable response as situations develop
- IMS will protect the Force during operations by tailoring protective counter-mobility and survivability support as well as by providing temporary and fixed site security
- IMS is a building block that can be used to emplace larger fields and cordon/isolate urban areas through means of persistent surveillance and screening

Anti-Vehicle/ Anti-Tank System



System Overview

Command & Control (C2)

- Via handheld controller
- Can control other munitions
- Spider radio as interim for Joint Tactical Radio System



Control Station



1500-3800 m

Dispensing Module(DM)

- Hand-emplaced
- 100m protective obstacle
- Employed in 5 minutes
- 145 lbs (max), 24"x24"x14.5"

Effects

- Lethal AV & self-protect AP
- Initiate Demolitions
- Munitions Adapter Module (MAM)

Modular Components

Effects Electronics Module

- Provides central C2 in the field
- Sensor fusion
- Munition controller

Sensors

- Enable coordinated attack
- Acoustic, seismic, & terminal sensors

Four Launcher Assemblies w/one AV effect each

Four Spider Miniature Grenade Launchers w/one AP effect each

Two Battery Modules, 30-day life

System Capabilities

- Self-Destruct & Self-Deactivate
- ON-OFF-ON — "Safe Passage"
- Transfer of control
- Large lethal engagement (100m)
- Provides situational awareness information
- Re-usable, modular design reduces log footprint
- 30-day operational life (tactical)
- Immediate kill "out of the box"
- Multiple DMs can create larger field

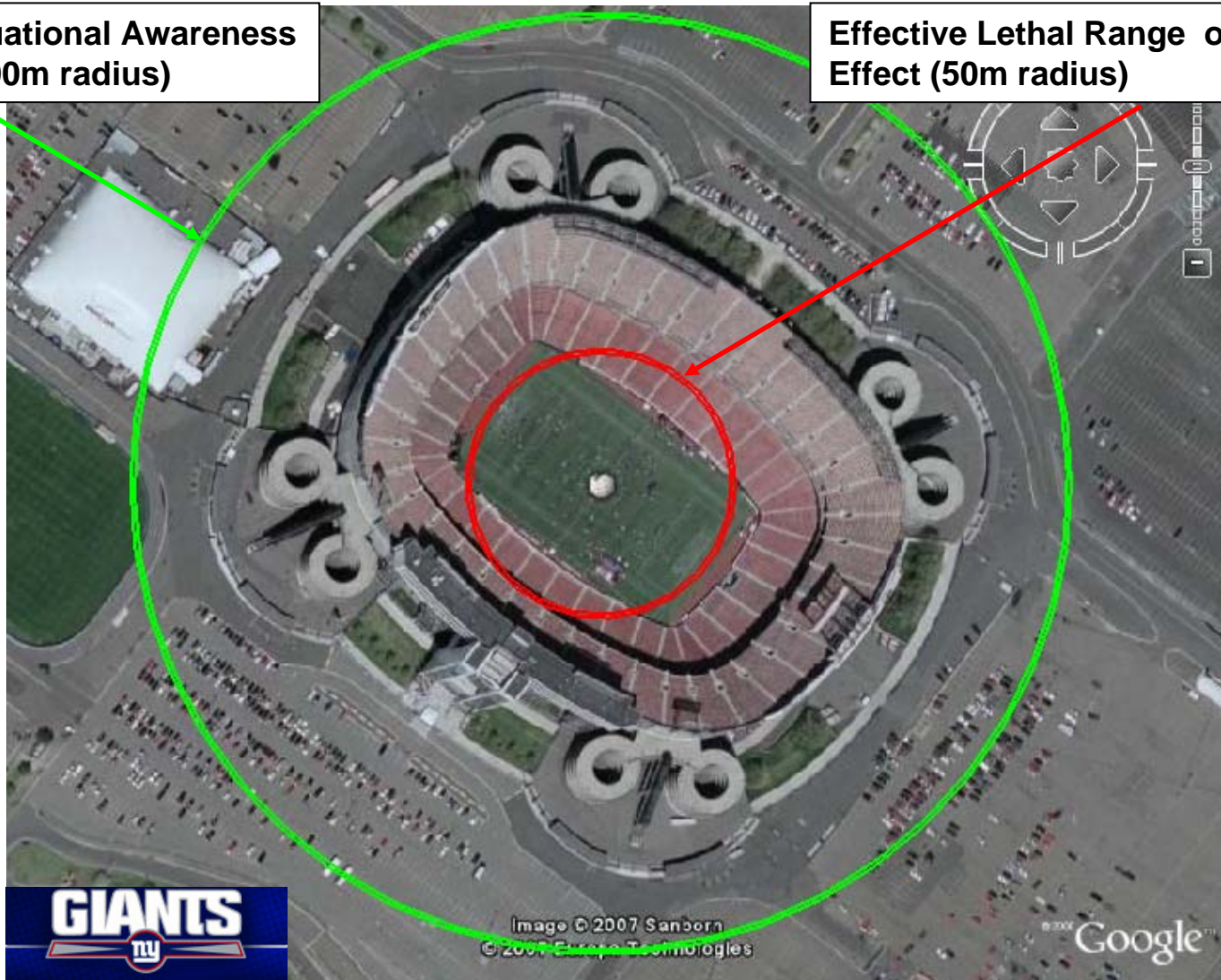


IMS Area of Influence

PM CLOSE COMBAT SYSTEMS

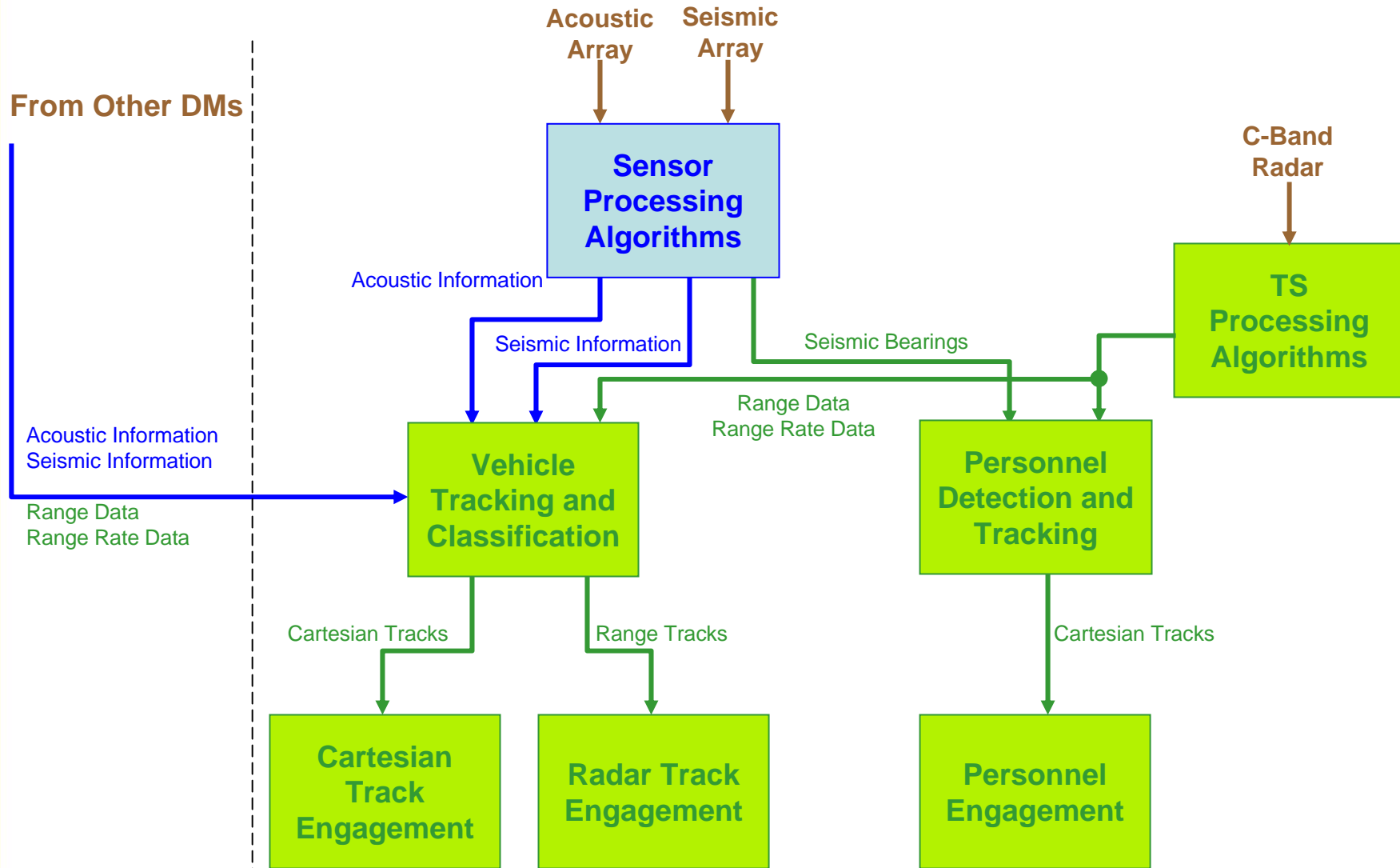
Effective Situational Awareness Coverage (200m radius)

Effective Lethal Range of AV Effect (50m radius)



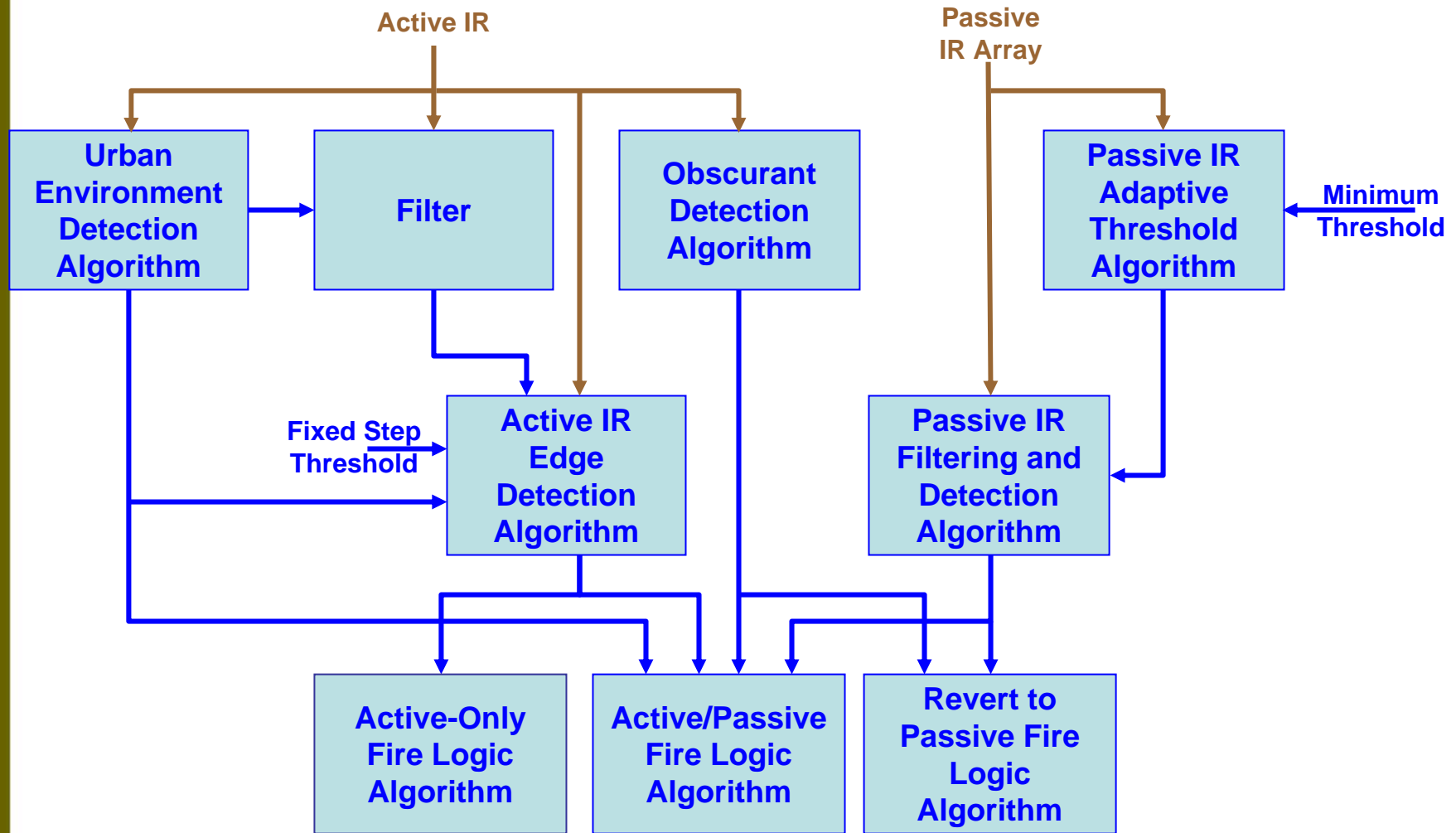


Ground Algorithm





Airborne Algorithm



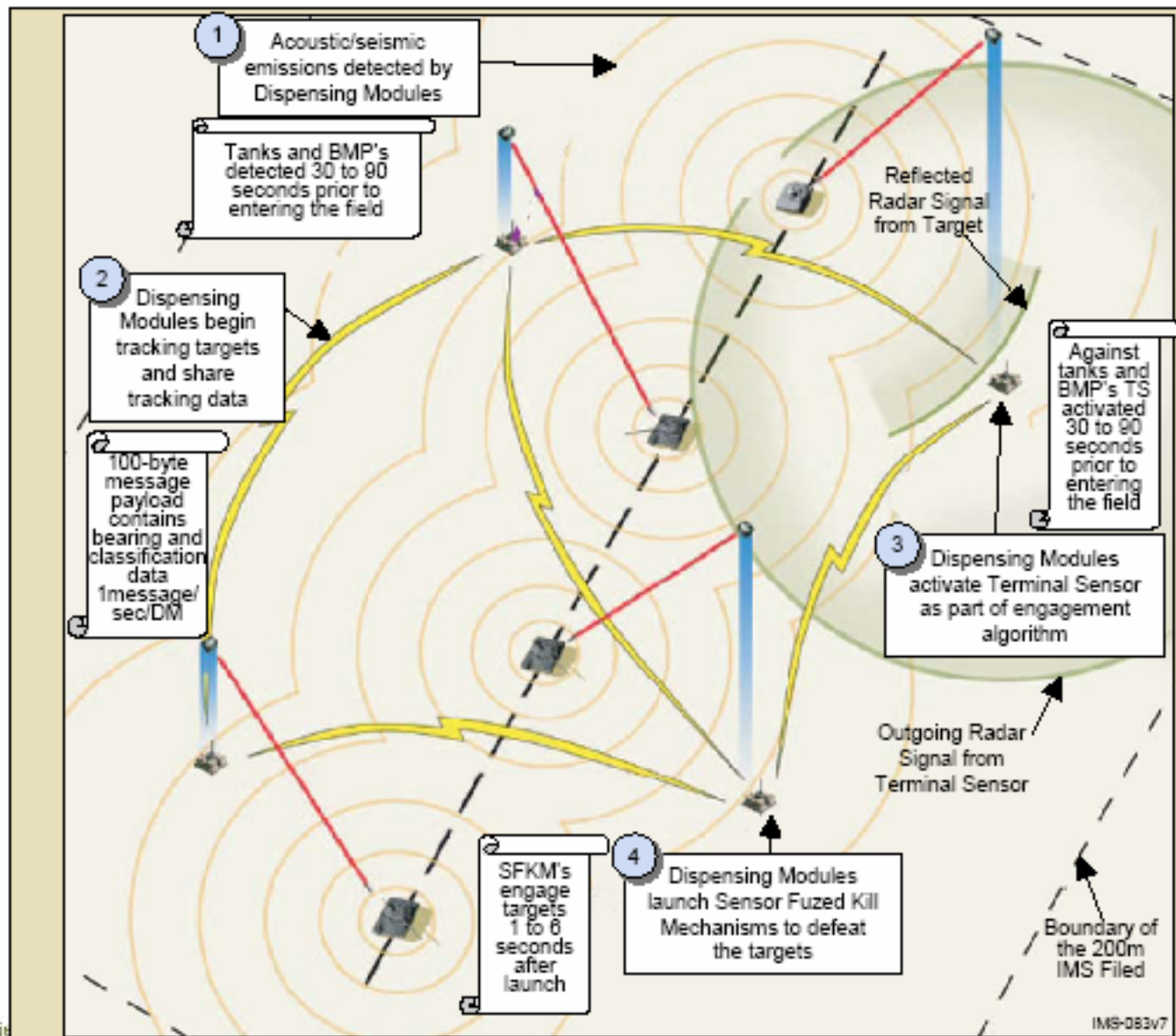


IMS Vehicle Engagement

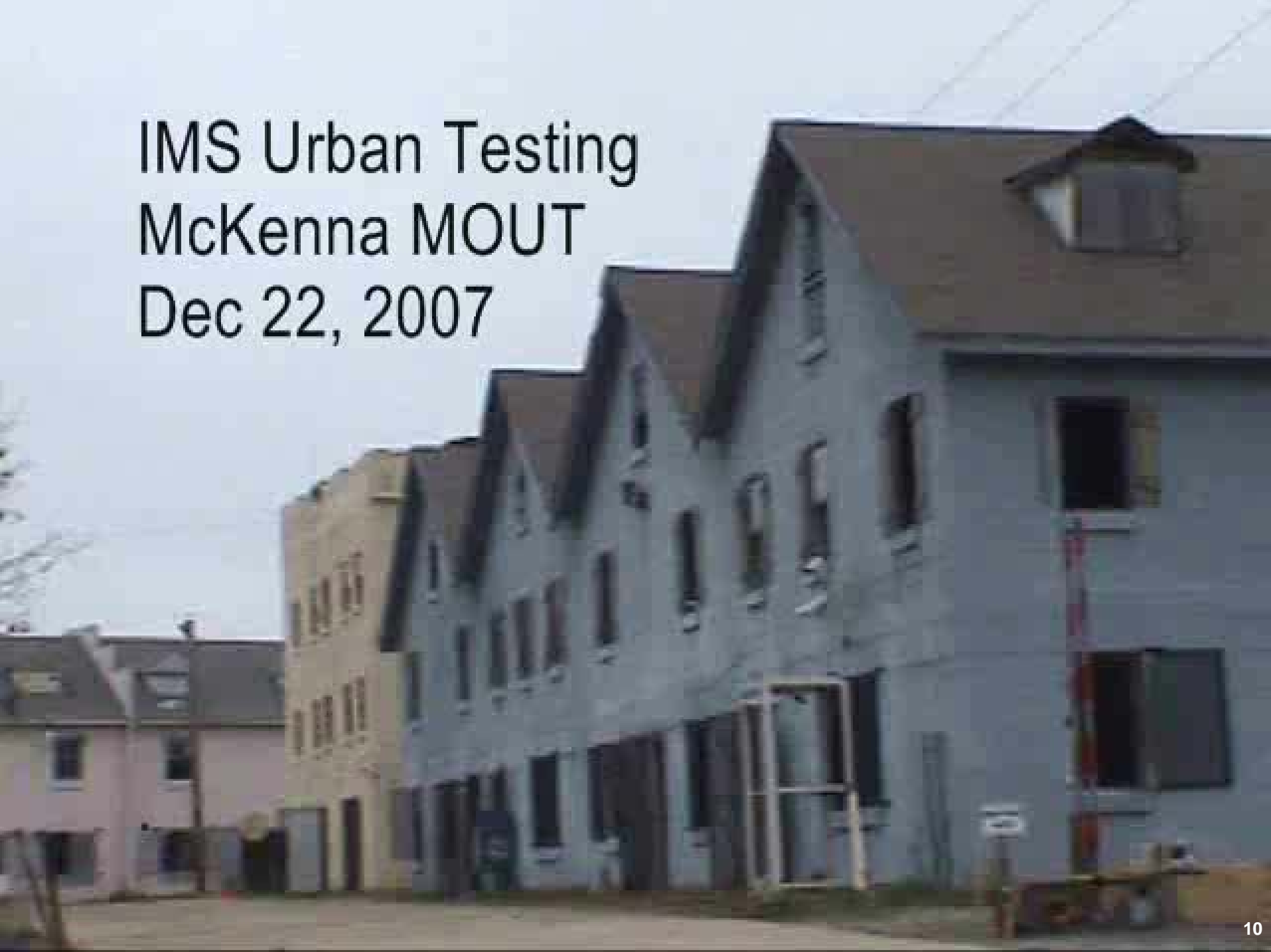
- Detects, classifies & tracks using acoustic & seismic sensors
- Engages using Terminal Sensor (radar) & tracking data
- Launches SFKM
- SFKM uses active/passive infrared sensor to detect vulnerable region of target
- SFKM initiates a copper combined effects warhead to defeat both heavily & lightly armored targets



An office within Project



IMS Urban Testing
McKenna MOUT
Dec 22, 2007






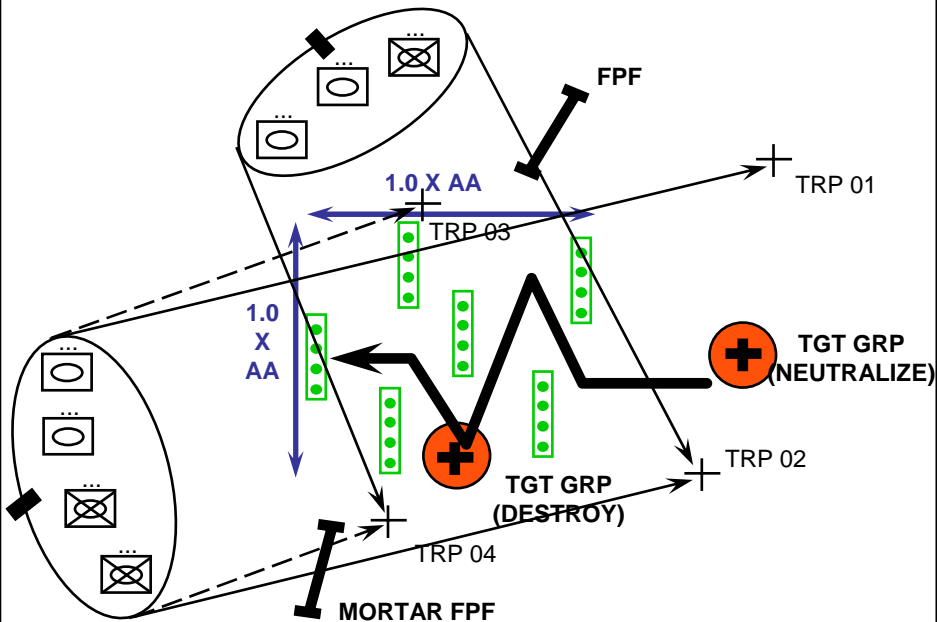
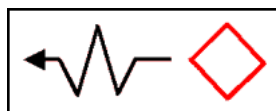
Tactics and Obstacle Effects

- **IMS can be deployed in multiple ways to fit the Warfighter's needs**
 - Offensive / defensive engagements
 - Open field and complex urban situations
 - Hasty Protection
- **IMS Delivery Methods:**
 - Hand Emplacement (Current Increment)
 - Ground Vehicles (Future Increments)
 - Remote (Future Increments)
- **Types of Obstacle Effects:**
 - Disrupt
 - Fix
 - Turn
 - Block

Fix

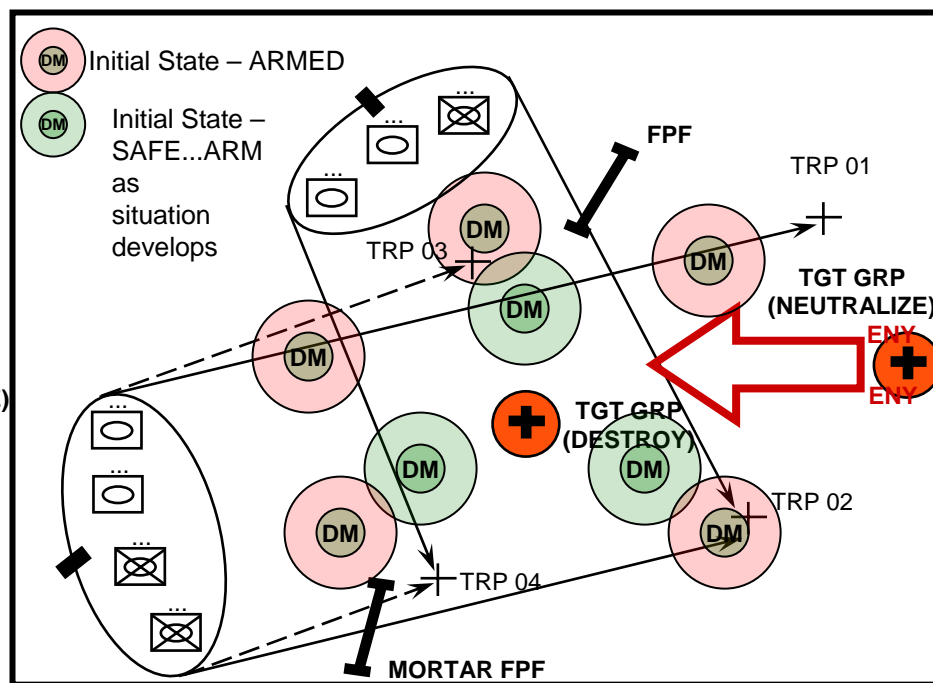
OBSTACLE GROUPs:	PURPOSE:	FIRES & OBSTACLES MUST:	OBSTACLE CHARACTERISTICS:	FM 3-90, Tactics, Appendix B
<p>FIX</p> 	<ul style="list-style-type: none"> <input type="checkbox"/> Slow an attacker within an area so he can be destroyed. <input type="checkbox"/> Generate the time necessary for the friendly force to disengage. 	<ul style="list-style-type: none"> <input type="checkbox"/> Cause the enemy to deploy into attack formation before encountering the obstacles. <input type="checkbox"/> Allow the enemy to advance slowly in an EA or AO. <input type="checkbox"/> Make the enemy fight in multiple directions once he is in the EA or AO. 	<ul style="list-style-type: none"> <input type="checkbox"/> Arrayed in depth. <input type="checkbox"/> Span the entire width of the avenue of approach. <input type="checkbox"/> Must not make the terrain appear impenetrable. 	

TODAY




With IMS

50-60% probability of encountering a DM lethal radius across a company frontage. Prob of Kill is .5 to .6 kills/meter.

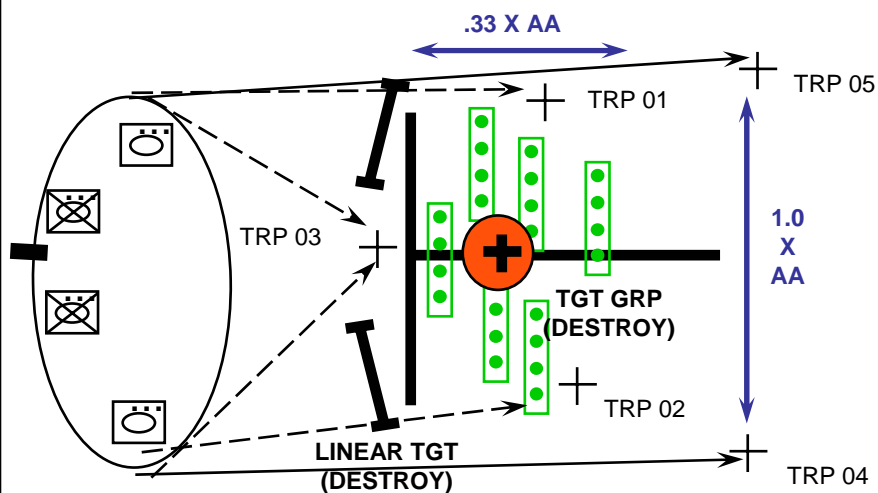
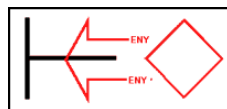
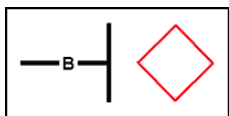


Block

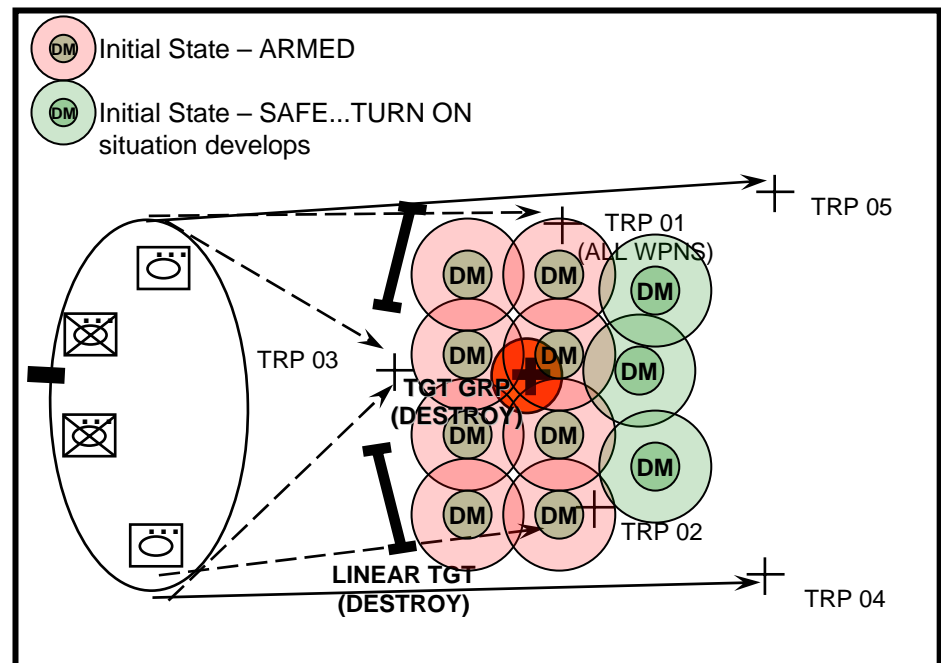
OBSTACLE GROUPS:	PURPOSE:	FIRES & OBSTACLES MUST:	OBSTACLE CHARACTERISTICS:	FM 3-90, Tactics, Appendix B
BLOCK 	<input type="checkbox"/> Stop an attacker along a specific avenue of approach. <input type="checkbox"/> Prevent an attacker from passing through an AO or EA. <input type="checkbox"/> Stop the enemy from using an avenue of approach and force him to use another avenue of approach.	<input type="checkbox"/> Prevent the enemy from bypassing or penetrating through the belt. <input type="checkbox"/> Stop the enemy's advance. <input type="checkbox"/> Destroy all enemy breach efforts.	<input type="checkbox"/> Must tie into impassable terrain. <input type="checkbox"/> Consist of complex obstacles. <input type="checkbox"/> Defeat the enemy's mounted and dismounted breaching effort.	

TODAY

With IMS



85+% probability of encountering a DM lethal radius across a company frontage. Prob of Kill is 1.1 kills/meter.





Summary

- **IMS is the program of record to replace the current persistent anti-vehicular/ anti-tank landmines**
- **Provides the Warfighter with “ON-OFF-ON” and “Safe Passage” capability.**
- **Provides the Warfighter with immediate lethality “out of the box”**
- **SFKMs achieve precision kills with minimum logistics footprint**
- **IMS leaves a clean battlefield**
- **IMS complies with US National Landmine Policy**



NSWC Dahlgren Division Picatinny Detachment

Firepower Conference
10-11 June 2008

Parsippany, NJ

Michael Till
NSWC Dahlgren
Head, Gun Systems &
Light Weapons Division (G30)
michael.till@navy.mil

Dave Rogers
NSWC Dahlgren
Picatinny Detachment
Transition Manager (G307)
david.l.rogers@navy.mil

BRAC Implementation – Recommendation #186
Integrated Weapons and Armament Specialty Site
for Guns & Ammunition at Picatinny Arsenal



Integrated Weapons & Armaments Specialty Site for Guns & Ammunition



BRAC 2005 RECOMMENDATION 186 TECH 0018B

Move Gun and Ammo RD&A functions to Picatinny Arsenal, NJ from:

- NSWC Crane Detachment at Fallbrook, CA
- NSWC Crane, IN (except energetics and RD&A T&E in support of Special Operations)
- NSWC Port Hueneme Detachment Louisville, KY
- NAWC China Lake, CA (except energetics)
- Adelphi Laboratory Center, MD **(Army)**

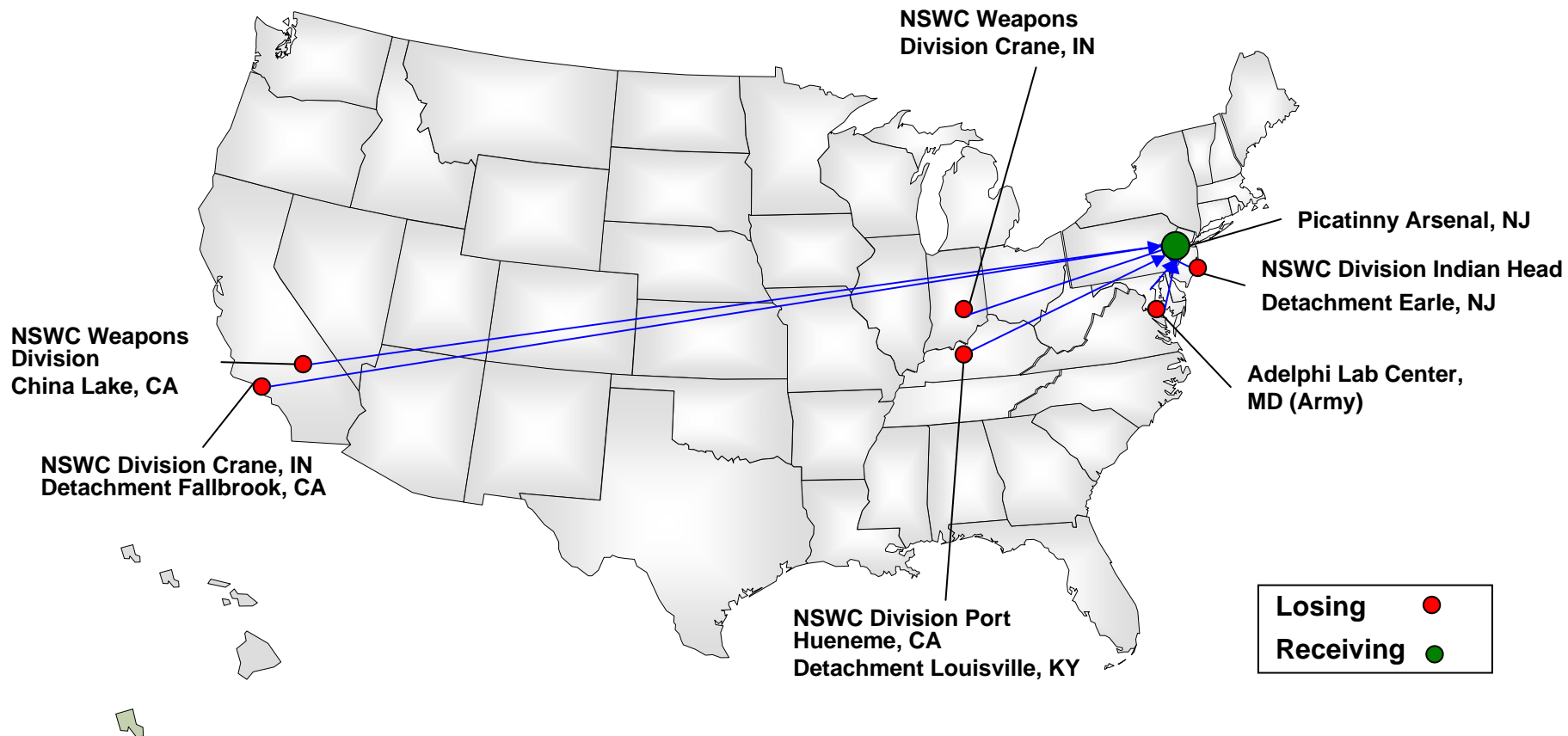
Move Weapon and Armament Packaging, Handling, Storage and Transportation (PHS&T) RD&A and T&E function from NSWC Indian Head Detachment Earle, Colts Neck, NJ



Integrated Weapons & Armaments Specialty Site for Guns & Ammunition



BRAC 2005 RECOMMENDATION 186 TECH 0018B





Approved Business Plan End-State

Realign 220, Eliminate 37



Crane (236 FTE)

- Guns & Ammo T&E (24 FTE)
- Special Ops RDA (127 FTE)

- Guns & Ammo Sustainment
 - Guns & Ammo PM
 - Guns & Ammo RDA (85 less 12 eliminations)
- (73 FTE)

Fallbrook (118 FTE)

- Guns & Ammo T&E (108 FTE)

- Guns & Ammo RDA (10 less 1 elimination) (9 FTE)

Earle (63 FTE)

- Weapons & Armament PHS&T (63 less 9 eliminations) (54 FTE)

Indian Head (43 FTE)

- Energetics (43 FTE)

China Lake (5 FTE)

- Guns & Ammo RDA (4 FTE) (5 less 1 elimination)

Dahlgren (83 FTE)

- Guns & Ammo RDA T&E (83 FTE)

Adelphi (44 FTE)

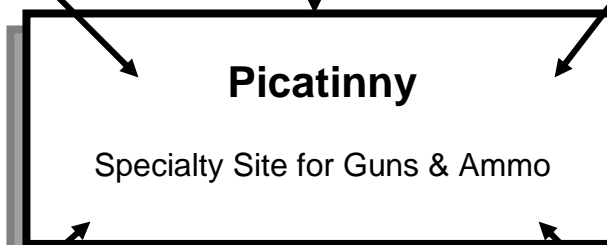
Army Action

Louisville (223 FTE)

- Guns & Ammo RDA (95 less 15 eliminations) (80 FTE)

- OEM On-site support (23 FTE)

- Non-Guns functions (105 FTE)



Legend: Excluded by BRAC

Realigned by BRAC

Criteria: Gov't FTEs based on BRAC certified data. On-site contractor FTEs not included



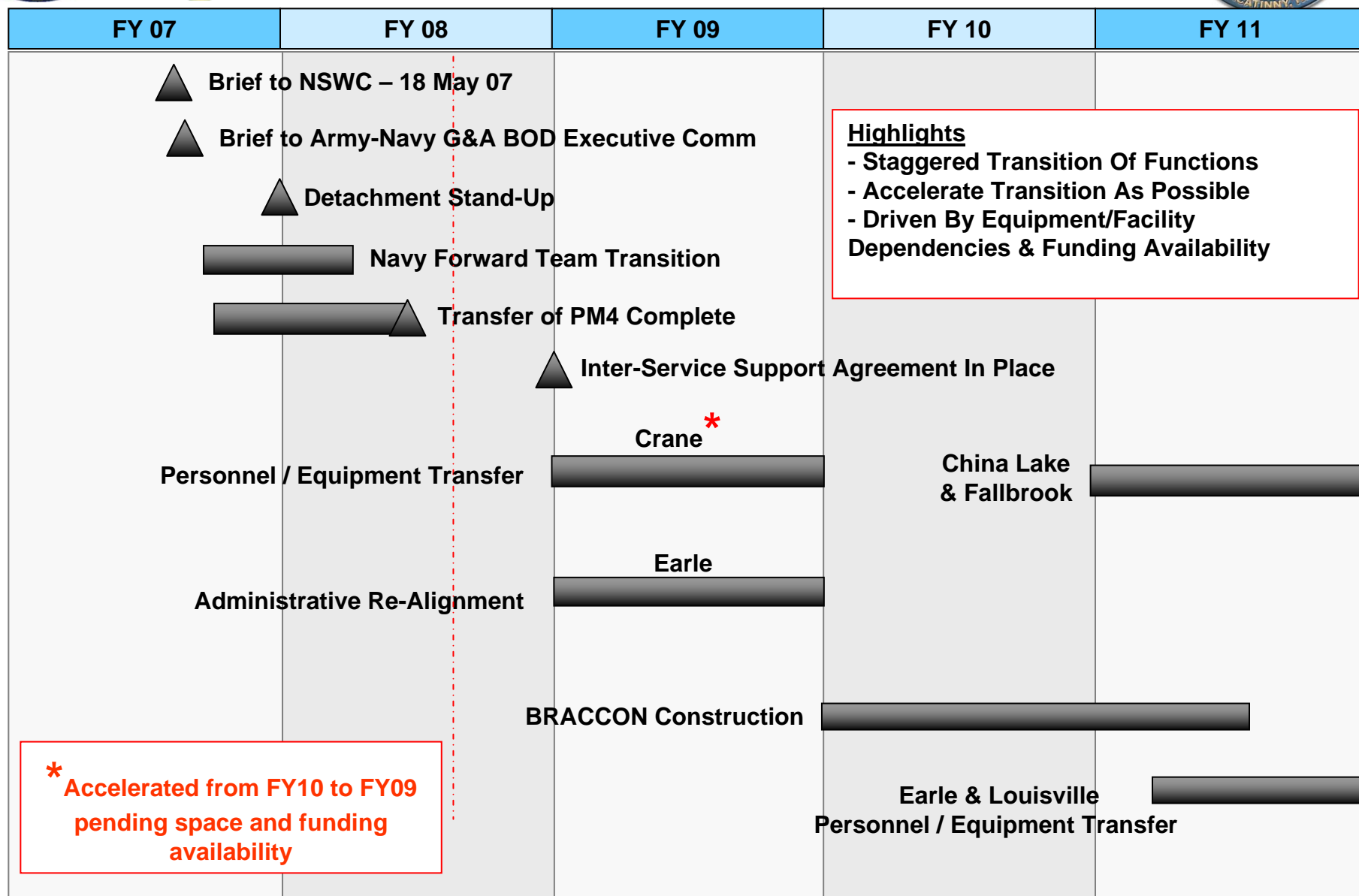
Transition Status



- Detachment established by Commander, Naval Sea Systems Command
 - ✓ Naval Surface Warfare Center, Dahlgren Division, Picatinny Detachment
 - ✓ Type II Detachment
 - ✓ Site UIC Assigned: 38634



Transition Implementation Schedule





Transition Status



- Crane early transition
 - PM Conventional Ammunition transition complete
 - Hired Requirements Manager 31 March 08
 - Currently have 7 people onboard
 - New employees are developing primarily through on the job training
 - Retained one experienced PM4 employee as a contractor to assist with the transition



Conventional Ammunition Program Office PM4 NSWC Crane



- Responsible for the management, in-service engineering and acquisition support of 2T Cog (Surface) Conventional Ammunition for the US Navy
- Provides Program Management of Ammunition in the following categories:
 - Small Caliber (thru .50Cal)
 - Minor Caliber (20MM thru 40MM)
 - Intermediate Caliber (57MM and 76MM)
 - Major Caliber (5 inch and 16 inch)
 - Pyrotechnics and Demolition Material
 - Ammo In-Service/Malfunction management
- SMCA & JOCG in-service interface for NAVSEA items.
- Manages 414 ammo configurations with an annual budget of approximately \$150M.



2T COG Conventional Ammo Organization



**Conventional
Ammunition APM**
LtCol Robert White
202-781-1880

**Ammunition
Engineer**
Steve Pitzel
202-781-1512

**Business and Financial
Manager (PANMC)**
Janette Yates
202-781-3556

**Wash,DC
Navy Yard**

Deputy Program Manager
Dion Serben
973-724-4286

**Picatinny
Detachment**

**Small Caliber
Ammo Manager**
Timothy Riffel
973-724-9301

**Major Caliber
Ammo Manager**
Elias Vainchenker
973-724-9609

**Minor/Intermediate Caliber
Ammo Manager**
Karen Ross
973-724-9250

Pyro/Demo Material Manager
Michael Hagn
973-724-6137

**Ammo
Requirements
Manager**
Elizabeth Kamp
(973) 724-9231

**Ammo In-Service/Malfunction
Manager**
Mike Bottass
973-724-9782

**Support Staff
Crane, IN**

Program Management
John Niehaus
812-854-3987

Financial Analyst
Melissa Ranard
812-854-4352

Acquisition Analyst
Lindsay Skinner
812-854-4351



Transition Status



- Crane Transition
 - Ammunition RD&A positions
 - Acquisition Engineering (AEA) function
 - In Service Engineering (ISEA) function
 - Planning a phased transition with potential hiring in FY 09
 - Positions identified
 - Includes journeyman and entry level
 - Swing space has been identified at Picatinny in building 3342
 - Concern is forward funding of BRAC \$ to support



Transition Status



- Earle Transition
 - Administrative transition to NSWC Dahlgren in FY09
 - Benefits the employees by aligning with future command earlier
 - MOA developed between IHD and DD to agree on the transition date and the process, currently in review
 - Expect to transition mid FY 09
 - No physical changes until BRACON complete
 - Majority of functions are facility dependant



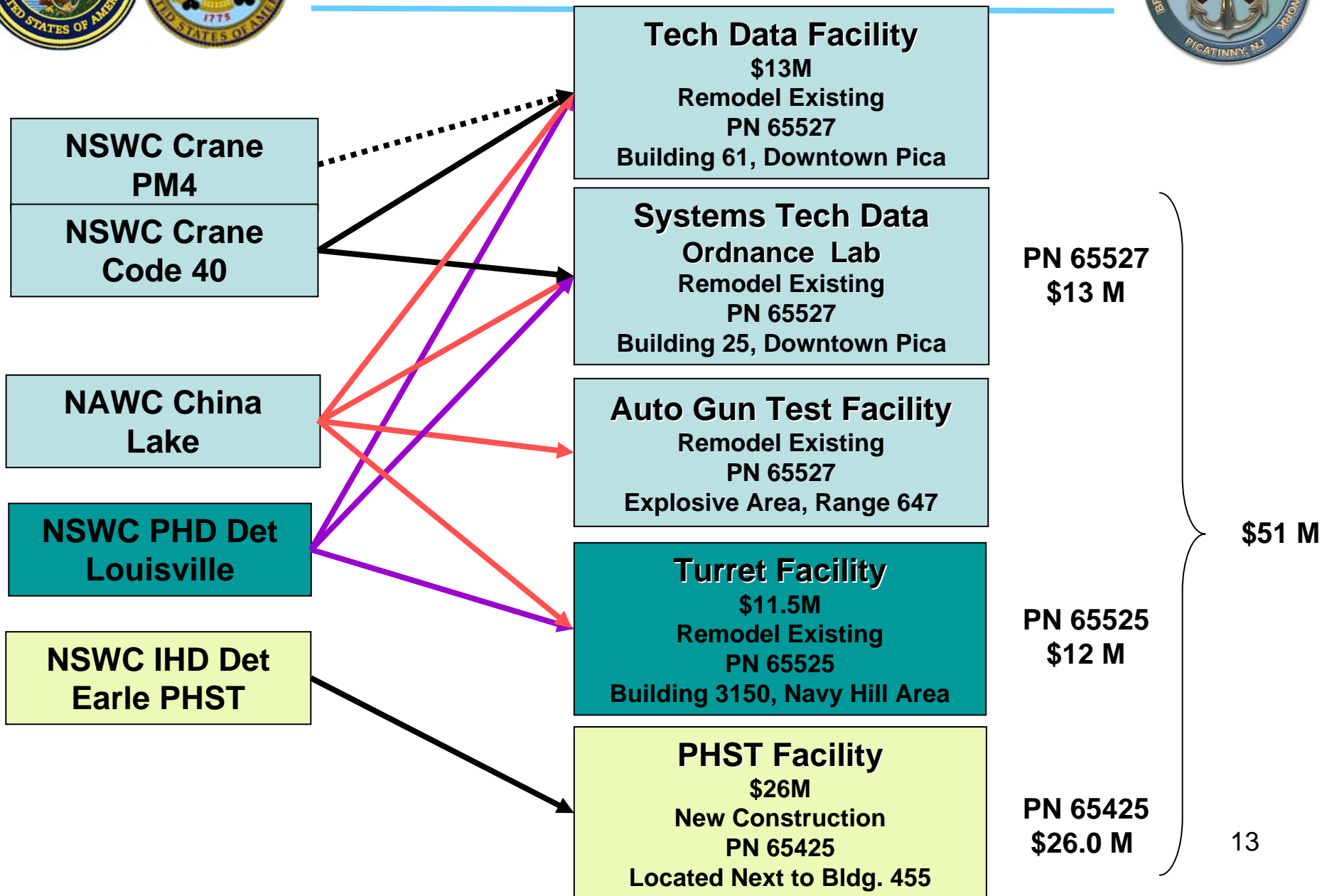
Transition Status



- Louisville and China Lake
 - Facility dependent
 - Planned for later transition



BRACON Fully Funded by Navy



Navy BRACONs Spread across Picatinny





BRACON Status



- DD-1391 65425 PHST Center
 - Recent Activities
 - Final Concept Report Issued Feb 2008
 - Upcoming events
 - 30% Design May 2008
- Project Schedule Milestones
 - Construction Contract Ready-to-advertise (RTA) Dec 2008
 - Award Construction Contract Mar 2009
 - Construction Complete Jan 2011
 - Moves complete Aug 2011



BRACON Status



- DD-1391 65525 Weapons Systems Lab (Turrets):
 - A&E contract Awarded
 - Site visit to Louisville conducted 27 April 08
 - Design Planning Charrette kickoff held at Picatinny 1 May 08
 - Design Charrette scheduled for 3-6 June 2008 at Picatinny
- Construction Project Milestones
 - Construction Contract Ready-to-advertise (RTA) Mar 2009
 - Award Construction Contract Jun 2009
 - Construction Complete Sept 2010
 - Moves Completed Mar 2011



BRACON Status



- DD-1391 65527 Tech Data Center
 - Tech Data Center Building 61 Renovation
 - Auto Gun Test Facility Range 647 New Construction
 - Gun Weapons Systems Lab Building 25 Renovation
- Recent Accomplishments
 - All sites visited by A&E in Feb-Mar
 - Design Charrette review at Picatinny 10-14 March
 - Charrette parametric design report issued
 - Design review held 5-7 May at Picatinny



Transition Tools



- Cross Service Guns and Ammo Executive Board of Directors
 - Rotating Chair, ARDEC about to turn over lead to NSWC HQ
 - Chartered with developing the Guns and Ammo enterprise vision for the future



Transition Tools



- Transition IPT
 - Wide participation with affected sites as well as Navy and Army leadership
- Tech Data IPT
 - Chartered to identify issues and challenges associated with bringing mass volumes of Navy tech data to Picatinny
- Human Capital IPT
 - Chartered with developing strategies to encourage people to come with the function as well as strategies to transition the knowledge
- Quarterly News Letter



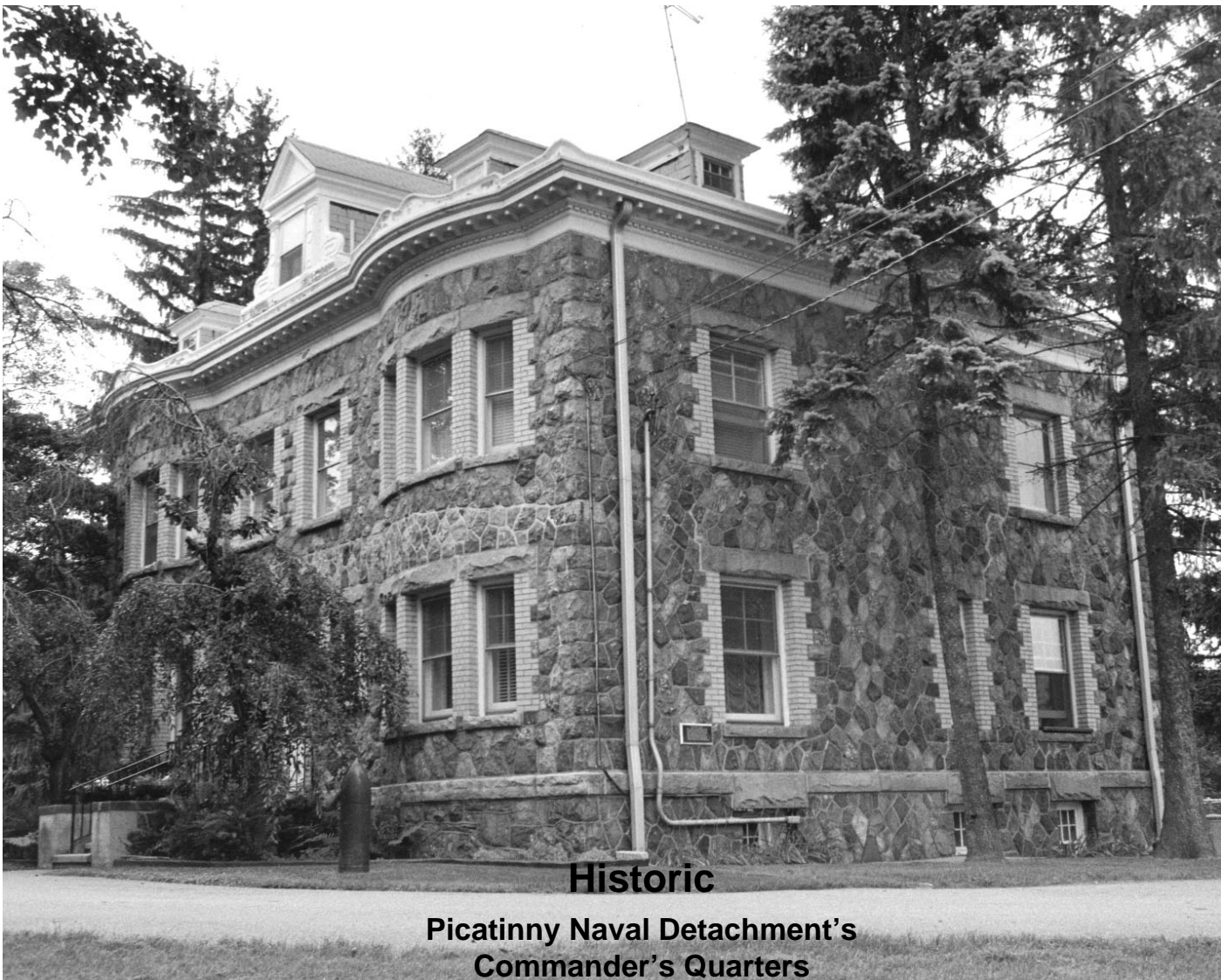
Summary



- Phased Transition Roadmap In Place
- Ammo PM Transfer complete
- Accelerating Transition within Funding and Facility Constraints
- Human Capital and retention of expertise is a major concern being addressed by an Integrated Product Team with membership from each site



Questions?



Historic

**Picatinny Naval Detachment's
Commander's Quarters**